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DECOLORATION OF ANTERIOR LAYER OF IRIS

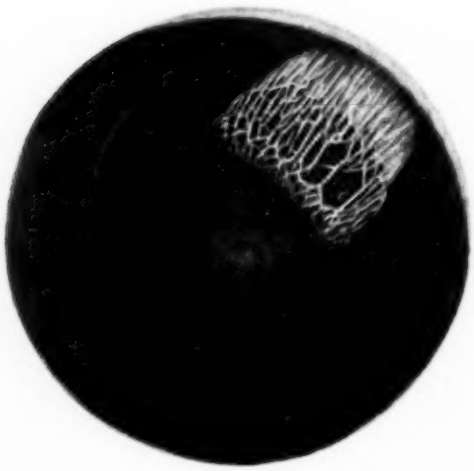

FIG. 1. IRIS OF RIGHT EYE OF CASE 1. (CORDS)

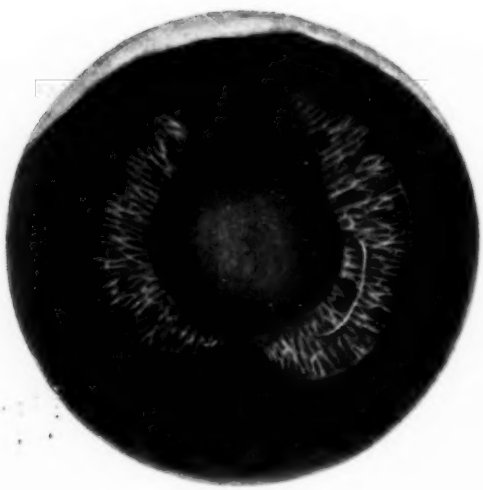

FIG. 2. IRIS OF RIGHT EYE OF CASE 2. (CORDS)

DECOLORATION OF ANTERIOR LAYER OF IRIS

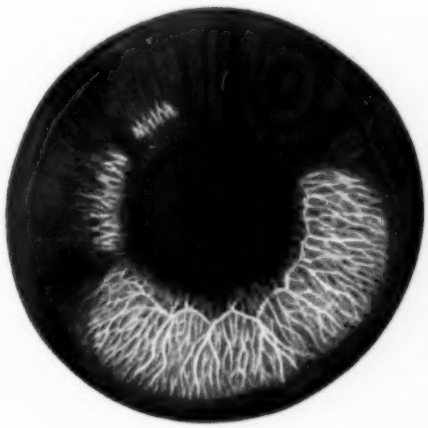

FIG. 3. IRIS OF LEFT EYE OF CASE 4. (CORDS)

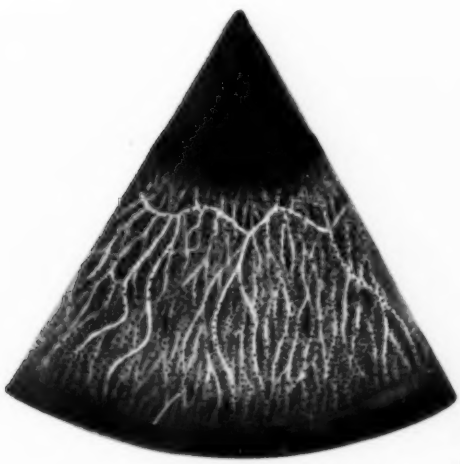

FIG. 4. SAME EYE AS FIG. 3 MORE MAGNIFIED TO SHOW SMALL BROWN SPOTS ON IRIS. (CORDS)

AMERICAN JOURNAL OF OPHTHALMOLOGY

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DECOLORATION OF THE SUPERFICIAL LAYER OF THE IRIS.

PROF. RICHARD CORDS, M.D.

COLOGNE, GERMANY.

This paper from the University Eye Clinic in Cologne, Germany, reports four cases of a peculiar form of decoloration of the iris, of which three are illustrated by colored pictures, Plates I and II. The causes are different: iridocyclitis, glaucoma and contusion of the eyeball. The origin of this alteration is discussed.

CASE 1. Elizabeth Z., 46 years old, did not perceive that she could not see with her right eye; until 10 days ago, a friend of hers told her that the eye was red.

Right eye: Vivid ciliary congestion. Cornea hazy and stippled. There were many small precipitates upon the posterior surface of the cornea, aqueous humor hazy, anterior chamber of normal depth. Iris of greenish color; the tissue showed no clear structure. Pupil was miotic and not round, numerous posterior synechiae, lens clear, vitreous full of dust like opacities; with the ophthalmoscope only red pupil reflex. No increase of tension was present. Only light and dark could be distinguished; good projection. Left eye: Entirely normal.

In short, there was a grave iridocyclitis, probably of syphilitic origin. The Wassermann reaction was not tested, because it was not known at that time.

During the hospital treatment, with atropin and mercury, the eye became quiet, but the patient would not stay longer than a fortnight.

Four weeks later the cornea was still hazy, and the precipitates persisted. The aqueous humor was clear, the pupil wide, but of irregular shape, posterior synechiae, vitreous clearer. V.=10/200. Afterwards the inflammation increased again. The precipitates became so numerous that the iris and pupil were scarcely to be seen. The precipitates are of deep brown color. V. only 1/500.

The patient did not continue the treatment and was seen again only 10 months later. The picture had thoroly altered. The ciliary congestion had disappeared. The surface of the cornea was clear. Tension was not increased. Upon the inferior part of Descemet's membrane very numerous precipitates were still to be seen; they were all of deep brown color. The larger part of the iris was of a deep brown color and showed no signs of the past iritis, except some posterior synechiae. A large sector of the upper nasal part had lost all the pigment. While in the normal part of the iris the thick pigment layer makes it impossible to see the trabecules, they are very distinctly to be seen in the described sector. (Plate 1, Fig. 1.) They formed a very clear network of pure white lines, between which small brown spots are disseminated; vessels were not to be seen in them. The discolored sector was sharply outlined against its suroundings. In its vicinity the iris showed a very dark coloration. The pupil is not round. In the decolored sector the iris is broader; the pupillary margin is almost straight like a tendon. On account of the posterior synechiae there is no movement of the pupil.

This decoloration concerns not only the anterior layer of the iris, but also the posterior. Everywhere the red light is seen thru the sector.

CASE 2. Barbara S., 63 years old. Patient wore spectacles all her life. She had a binocular iridocyclitis 12 years ago with glaucoma following. Iridectomy was performed on both eyes. Since that time she could neither read

nor write. Vision became gradually worse.

Jan. 12, 1920. *Right eye*: No congestion, cornea clear. At the upper limbus a small scar of 5 mm. length, from which a grey tongue shaped spot extends to center of the cornea. Anterior chamber shallow. Circular posterior synechiae. Small coloboma upwards. In its marginal parts the iris has a deep brown color; the surface looks like velvet and the trabecules are not to be seen. The whole inner part of the iris in a breadth of 2-3 mm. has lost almost all the pigment. (Plate 1, Fig. 2.) Only in the midst of the inferior part the pigment reaches the pupillary margin. In this altered area, the trabecules are quite clearly visible in the form of white stripes. Only with the corneal microscope and the slit lamp a few pigment cells are to be seen, scattered in the tissue. The sphincter muscle is visible as a small yellowish ribbon, but there is no contraction of it on account of the synechiae. The pigment layer of the iris is evidently normal, because no red reflex passes the altered part of the membrane. Rather dense nuclear cataract; no details of the fundus can be seen. V.=Movement of the hand in all parts of the visual field. Tension normal.

Left eye: No congestion. Small scar in the inferior limbus. Epithelium of the cornea not quite smooth, but a little stippled, especially in the inferior part. The examination with the microscope and the slit lamp shows different folds of the Descemet membrane. Anterior chamber shallow. The iris shows nearly the same alterations as in the right eye. Small inferior coloboma. Only the peripheral parts of the iris are deeply stained. Near the pupillary margin, in a breadth of 3 mm., the whole pigment is lost and only some brown spots are scattered in the tissue. Deep brown nuclear cataract. V.: Fingers are counted at 0.5 m. Good projection of light. Normal tension.

On the next day the extraction of the right lens was made without complication, and afterwards the needling of the secondary cataract. No improvement of vision, because the cornea remains hazy and the vitreous is full of dust like opacities.

Briefly, we see in this case the consequences of a severe iridocyclitis with posterior synechiae, seclusio pupillae and subsequent glaucoma, nuclear cataract and opacities of the vitreous. Instead of an atrophy of the whole iris with narrowing of the trabecules and the well known greyish-blue color, we perceive only a complete loss of pigment in the superficial layer near the pupil. The Wassermann reaction being negative, we must assume that the disease had probably a tuberculous etiology.

Case 3. Johann K., 50 years old, got a slight contusion of his right eye on Jan. 26, 1922. Some days afterwards, there were all the signs of an acute glaucoma after using atropin. When I saw the patient first, the cornea was stippled, the anterior chamber shallow, the pupil wide, the tension 60 mm. Hg. (Schioetz.) There was only perception of light. The iris had a greyish-blue color and seemed to be a little atrophic.

An iridectomy was performed, after which a small hemorrhage in the anterior chamber persisted for some days. The tension was normal at first, and vision became 1/12. A fortnight later, however, the tension increased again, the anterior chamber being extremely shallow.

April 26, a cyclodialysis was made, after which the tension was normal again. The effect lasting only 10 days, I finally made a trephining, after which the tension remained normal until now, that is for one year. During that time the iris lost the greater part of its pigment.

Present state: The eye is pale. Pupil larger than normal. Broad coloboma upwards. Cornea clear. Peripheral parts of the iris of a blue color. Near the pupillary margin, in a breadth of 2-3 mm., almost all the pigment is lost and the trabecules are to be seen as white ribbons. There is some atrophy of the whole tissue. With the corneal microscope many small brown spots are to be seen on the iris and on the lentic-

cular capsule. Lens and vitreous clear. Glaucomatous excavation of the disc. V. with +3. S.⊃Cyl.+0.75 ax. 45°= 5/15. Visual field only 20-30° from the fixation point.

Case 4. Caroline K., 15 years old. Patient was shot with a pop-gun, 8 months ago. She immediately went to an oculist, who found the left eye very much congested. In the inferior temporal part of the cornea there was a large erosion, in the midst of which a wound of 1 mm. length penetrated into the external layer of the cornea. Some foreign bodies were removed. The wound certainly did not penetrate into the anterior chamber. Iris and lens showed no alteration. The eye became pale and painless within 2-3 weeks.

Present state: Cornea clear except a small macula in the midst of the medial half. No congestion. The pupil is distinctly larger than in the right eye. The light reaction is prompt in the superior part, but very slight in the inferior. No posterior synechiae; lens and vitreous clear, V.=6/6.

The examination with the Zeiss microscope shows a very peculiar picture. While the right iris is of a dark brown color, with a velvet like surface, we see this coloring in the left one only in the superior half. In the inferior the pigment of the superficial layer has almost completely disappeared and the trabecules, which cannot be seen in the normal part, are visible as a network of small white ribbons, with a tree like ramification. (Plate 2, Fig. 3.) The iris gets by this alteration in lamp light a white, in daylight a bluish-white color.

The tissue is not atrophic; in the altered part the tissue does not seem to be thinner and less prominent. There is only an almost complete loss of the pigment. But this has not quite disappeared; with the greater enlargement we see the whole superficies as powdered over with small, round, brown spots (Plate 2, Fig. 4), which lie partially isolated, partially in small lumps. The whole looks like thick milk, strewn with cinnamon. At the pupillary margin the brown spots lie more densely and are more numerous; in some parts they form accumulations like the eggs of a spider. The sphincter muscle is not visible. The border of the discolored area is not so sharp as in the other cases. Especially in the upper part the normal part goes quite gradually over into the decolored area.

This case is very peculiar, because there was no inflammation of the iris and no glaucoma, but only a contusion of the eye and a quite superficial lesion of the cornea. The patient observed that the color of the eye changed gradually after the trauma, and the eye surgeon who saw her at first did not perceive any difference between the colors of the two irides, as he writes in reply to my question.

In all these cases circumscribed parts of the superficial layer of the iris are completely decolored. There is *no atrophy*, because the trabecules have a normal form and size. An atrophy looks quite different; there is no white, but a greyish-blue color and the trabecules are small and straight. The whole tissue looks like grey blotting paper (Fuchs). Sometimes, as in the third case, a combination of atrophy and decoloration appears on the same eye, especially in glaucoma.

The four cases demonstrate that this form of decoloration may be caused by quite different conditions; iridocyclitis, glaucoma and contusion of the eyeball.

In *glaucoma* decoloration is best known. We find in the German literature some papers about the scattering of pigment (Pigmentzerstreuung) in glaucoma. At first Levinsohn[1 and 2] found, in his pathologic examinations of glaucoma simplex, that in these cases numerous small pigment cells lie between the ligamentum pectinatum in the Fontana's spaces. These findings, which were confirmed by Roenne[3], Thomsen[4] and Hanssen[5], induced Levinsohn to propose a new theory of glaucoma, called the "pigment theory."

In 1916 Koeppe[6] found with the slit lamp, that dark brown pigment spots lie dust like between the whole superficial tissue of the iris. They may be so fine and thin that they look like ground pepper; sometimes they are collected into small crumbs. The color of the spots

being very dark, Koeppe thinks that they are derived from the pigment layer. Indeed, in many cases, in which the pigment lies especially near the pupillary margin, the pigment cells of the posterior layer are often corroded and destroyed. He thinks that it is possible to diagnose from this scattering of pigment a preliminary state of glaucoma, the "Praeglaukom," as he calls it; a supposition, which, however, was not accepted by most of the authorities on glaucoma. My fourth case, too, speaks against the theory of Koeppe. There is such an extensive scattering of pigment on the iris, that it must be curious, that no signs of glaucoma were to be seen.

About the "Pigmentzerstreuung" Augstein[7 and 8], too, wrote a very interesting paper. He showed that after an operation for cataract or glaucoma the scattering of pigment is quite typical. In these cases the whole inferior part of the iris is covered with small brown spots, looking like cinnamon or snuff. Also, after an iritis this scattering of pigment is not rare, as Vossius[9] showed; it is visible especially in those cases, in which an iridectomy has been made. Vossius describes the case of a man of 29 years, who had an interstitial keratitis with iritis, after which the whole iris was sown over with pigment spots. He supposes, that in these cases the pigment is derived from the posterior layer of the iris, from which sometimes large masses of pigment are detached. Scarifications of the pigment cells in this layer are also described by Axenfeld[10] in old people. This author thinks that there is some connection with the etiology of cataract. Soewarno[11], too, discusses this question. He finds in glaucoma a nacre-grey decoloration of the pupillary margin, beginning mostly on both borders of the coloboma. The decolored parts are distinctly bordered are seldom broader than a few millimeters, and sown all over with many pigment spots. The normal relief of the iris has disappeared. Soewarno thinks, that the decoloration is the consequence of noxious influences, working on the iris, its vessels and nerves, during the glaucomatous attack. A peculiar form of decoloration Soewarno found in syphilitic patients, where white spots are to be seen in the ciliary part of the iris. Koeppe[12] says, that in cases of absolute or progressive glaucoma with a dark brown iris, a dissolving of the superficial pigment is not very rare, and that this change is often to be seen in a circumscribed or sector like part of the membrane, as in our cases. The light brown pigment is in these parts completely rarefied; in some parts it has disappeared, in others it lies together in the form of small clumps. Koeppe supposes that in these cases probably a simple dissolution of the cells takes place, and that rests of the pigment remain in the form of small insulas. But I do not find a reference that the pigment may so completely disappear as in my cases. Finally, Levinsohn[13] observed a peculiar decoloration of the iris in a woman of 61 years after one severe attack of glaucoma. Moreover, he found in a man of 54, after an attack of glaucoma, a light-grey iris in this eye, while the other was light-brown. Looking back upon our cases, we see that the cases 2 and 3 resemble those of Vossius and Soewarno. The decoloration concerns the pupillary part of the iris and especially the margin of the coloboma. Probably in these cases the nutrition of the tissue is not only disturbed by the iritis or the glaucoma, but also by the cutting of the vessels of the circulus iridis. Much more curious is case 1, in which a sharply bordered broad sector of the iris is completely decolored from the pupil to the ciliary body. We must assume, that during the iritis, by obliteration or thrombosis of all the afferent vessels, a kind of infarct took place in the altered sector. The chromatophores are perhaps more involved by malnutrition than the other cells, especially those of the connective tissue. But these too and the flat muscle fibers of the dilatator must have been disturbed, because the elasticity of the tissue was lost.

I find the greatest difficulties in explaining case 4. In the early period after the heavy contusion, there was no alteration of the iris to be seen; the decoloration appeared gradually some weeks later. We have no reason to assume an interruption of the circulation, but may think of

a nervous origin. We remember the alteration of color in many cases of paresis of the sympathetic, where we see a loss of pigment too, even tho not a complete one. Perhaps there was a combination of a transitory paresis of the sympathetic nerve fibres and a cramp in the vasoconstrictors of the iris.

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ISOLATED FAVUS OF THE EYELID. REPORT OF A CASE.

SIGMUND S. GREENBAUM, M.D.

PHILADELPHIA, PA.

In this case the lesion was confined to the right lower lid near its margin. It remained and extended for several months until its character was recognized clinically and the diagnosis confirmed by mycologic studies and cultures. From the Research Institute of Cutaneous Medicine and the Graduate School of Medicine, University of Pennsylvania, Polyclinic Section.

Favus, or honeycomb ringworm of the scalp, in association with isolated or generalized favus of the cutaneous surfaces is generally known and not uncommon in certain countries, namely, Poland, Russia and Austria. Favus in the native American is excessively rare, and but few cases of isolated favus of the skin, without an associated scalp affection, have ever been reported. Judging from the literature, it is a medical curiosity in America, particularly when the causative organism is the animal and not the human species of achorion. Irrespective of the parasite, the clinical appearance, whether it occurs on the scalp or on the skin, is apt to be the same; that is, a slow growth in the form of typical, sulphur yellow, cup shaped crusts, called scutula.

CASE. R. S., white, male, age 10, referred for examination by the orthopedic section, service of Dr. DeForrest Willard. On the 8th day of August, the child, who had been in the hospital for several months because of a congenital hip dislocation, developed a split pea sized, yellow, distinctly cup shaped crust, on the lower right eyelid just beneath the ciliary margin; this gradually enlarged and covered an area, the size of a half-nickel. On first glance, there seemed to be a distinct ulceration beneath this crust; but upon gentle removal of the crust, altho there was some slight bleeding, the subjacent surface was found to be in the main, simply erythematous, with a very mild amount of epidermic infiltration and several small erosions here and there.

The clinical diagnosis was favus, which was confirmed by mycologic and cultural studies. A portion of the crust examined microscopically was found to be composed of pure mycelium and spores; the growth on Sabouraud's conservation medium was almost pure, and the organism was identified as the Achorion Quinckeanum or mouse favus.

By August 20, the lesion had undergone an almost 80% spontaneous regression, at which time the accompanying photograph was taken.

COMMENT. Favus is generally a disease of the scalp, but it sometimes invades the cutaneous surfaces, usually, but not always, as in this instance, in association with disease of the scalp. On the body, the lesions have the same general characteristics as on the scalp, but may be accompanied by circular ringed patches resembling ordinary ringworm.

The characteristic lesion of favus is a yellow (which color may vary slightly, due to admixture of epidermic cells and dirt), saucer shaped crust. This scutulum is composed mainly of spores and mycelial threads, of a vegetable parasite—the achorion, belonging to the mould fungi—of which there are several species (A. Schoenleinii, the human parasite; the A. Quinckeanum, the mouse parasite; the A. Gallinae, the fowl parasite, etc.) As is known, and as occurred in our patient, the animal parasites may become parasitic to man.

On the scalp, chronic favus is accompanied by atrophic and cicatricial changes, with a subsequent permanent alopecia. This may be explained by the fact that, according to some authors, the organism is, in a sense, pyogenic, since definite intradermic collections of pus are in many instances found beneath the early scutulum. When favus occurs on the skin there is, ordinarily, less tendency to atrophic changes in the subjacent skin. It is more apt to disappear spontaneously as occurred in the reported case.

According to Sabouraud (Les Teignes, p. 534, Masson et Cie Paris 1910.): "Favus of the face may present the following three aspects:

1. A form almost constant in the course of favus of the scalp, in which there are disseminated here and there upon the face, nose, forehead and neck, pink scaly spots, which are aborted favic inoculations. Most disappear

Fig. -. Photographs taken when lesion had undergone fully 80% spontaneous regression. The size of the lesion may be estimated from the general outline made by the single large and the several smaller crusts.

without leaving a trace; and altho they are most often seen at the outset of a scalp favus, may likewise be observed occurring coincidentally with scalp favus over a period of years.

2. Sometimes, for reasons not known, one of the above lesions develops and assumes the following appearance: a larger, pinker scaly spot, some writers have even described crusts and vesicles, and experimental inoculation of chicken favus to man demonstrates this latter possibility. But there is often neither crusts nor vesicles, simply an erythematous, millet seed sized very apparent yellow slightly scaly surface, on which appear discs.

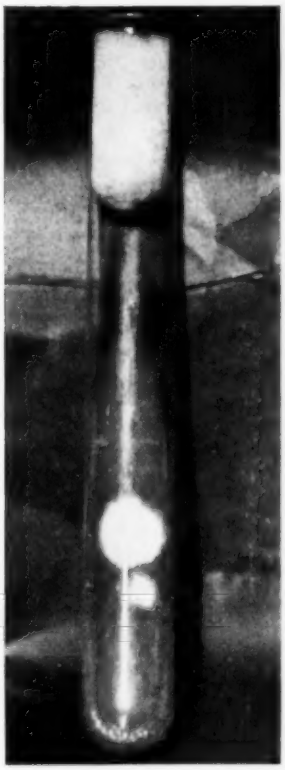

Fig. 2. The Achorion Quinckeanum on peptone-agar medium.

3. Derville has seen and described a third form of onset, such as we ourselves have observed on the scalp in epidemic favus and described under the term papyroid favus. These various forms may be associated, and one may see discoid and annular circles as well as small and large scutula. On the face, one of the points most often affected is the eyelid."

A NEW ASTIGMATIC CHART.

JONAS S. FRIEDENWALD, M.D.

BALTIMORE, MD.

A new astigmatic chart which the writer has found useful is described, and the theoretic considerations which determine the scope and degree of its usefulness are discussed.

The great number and variety of charts that have been devised for the subjective determination of astigmatism, bear excellent testimony to the very general lack of satisfaction obtained from any of them. Many ophthalmologists, indeed, claim that such charts are of no use to them at all, or that they require such a degree of intelligent discrimination on the part of the patient as to limit their applicability to a very small number of cases. The writer believes, that by a careful consideration of the type of service the charts should give, and of the means available for enhancing their usefulness in that particular service, one might arrive at a chart of greatly increased value.

The determination of the axis and degree of astigmatism, in cases of low degrees of error and high visual acuity, is one of the most difficult problems of the refractionist, and it is for these cases that most astigmatic charts give least satisfaction. On the other hand, in cases of high degrees of astigmatism, the axis and, within useful limits, the degree of error are readily discovered by other means; while in cases of low visual acuity, the accurate determination of these factors is not so important. Assuming, then, a high degree of visual acuity on the part of the patient, the need is for an increase in the contrast between the elements of the chart which are clearly seen and those which are out of focus.

The contrast between the elements sharply in focus and those out of focus is a function of the contrast of each of these in relation to the background. In other words, the desired chart is one in which the lines sharply in focus stand out clearly from the background, while those less sharply in focus merge into the background. Obviously, for a given astigmatic error, a wide black line on a white background suffers less graying thru admixture of the blurred fringe of the background than does a narrow line. These considerations led the writer to the notion of narrow black lines with white borders, placed on a background of gray, equivalent to a mixture of the white and black. The concomitant notion of colored lines with a differently colored border on a background of a color equivalent to their mixture, was soon discarded because of the disturbing effect of the chromatic aberration of the eye.

The sensitivity of a chart is, then, dependent on two factors: (a) the ratio of the width of the blurred margin of the image, more strictly the width of the diffusion areas in the image, to the width of the image if it were clearly seen; and (b) the degree of match between the shade of the background and the shade of elements of the image produced by the overlapping of the diffusion areas of the images of adjacent elements in the chart. A brief mathematical consideration of this first factor (a) is given, because of its usefulness in comparing photographs of the charts taken thru a cylindrical lens added to the camera objective, with the image of the same charts on the retina of an astigmatic eye. It should from the first be obvious that this factor varies directly with the degree of astigmatism and the size of the pupil—elements which control the width of the diffusion areas—and inversely with the visual angle subtended by the object—the element which controls the size of the image. It will have been noted, of course, that in all this discussion the writer is assuming the spherical correction to have been so adjusted that one of the focal lines (the posterior focal line) of the astigmatism lies in the plane of the retina or photographic plate.

Referring to figure 1, the desired proportion is $\frac{d}{h}$; h being the width of the

image as clearly seen; *d* being the length of the diffusion line of the image of any point in the object.

The value of *d*, for object distance sufficiently great to be considered infinite, may be determined as follows. Let F_1, be the focal length of the meridian whose focal point lies on the retina. The dioptric power of this meridian is $\frac{1}{F_1}$.

Let F_2 be the focal length of the perpendicular meridian, $\frac{1}{F_2}$ its focal power.

If A be the degree of astigmatism measured in diopters, and if F_1 and F_2 have been measured in fractions of a meter, then:

$$\frac{1}{F_2} = \frac{1}{F_1} + A$$

$$F_1 = \frac{1}{\frac{1}{F_1} + A} = \frac{F_1}{1 + F_1 A}$$

Fig. 1.

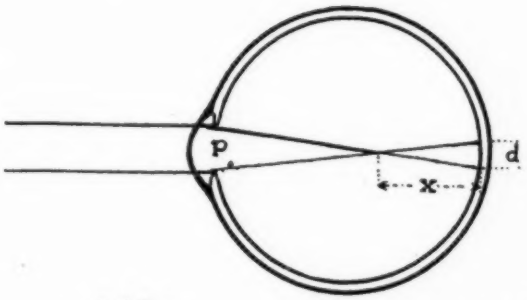

Fig. 2

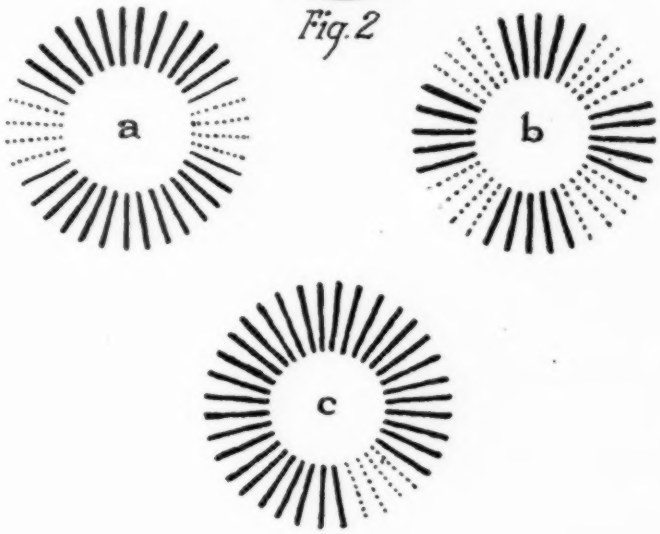

Fig. 3

Fig. 1. Image as clearly seen (left) and as seen with astigmatism (right).
Fig. 2. Image formed in front of retina, distance X. p, pupil and d, diffusion image.
Fig. 3. Appearance of chart as seen by patient with slight irregular astigmatism. (b and c, contrasted with regular astigmatism a).

The focus of the second meridian will be at a distance $F_1—F_2$ from the retina (see figure 2.)

$$X = F_1 - F_2 = F_1 - \frac{F_1}{1+F_1A}$$

$$F_1\left[1-\frac{1}{1+F_1A}\right] = F_1\left[\frac{1+F_1A-1}{1+F_1A}\right]$$

$$= \frac{F^2{}_1A}{1+F_1A}$$

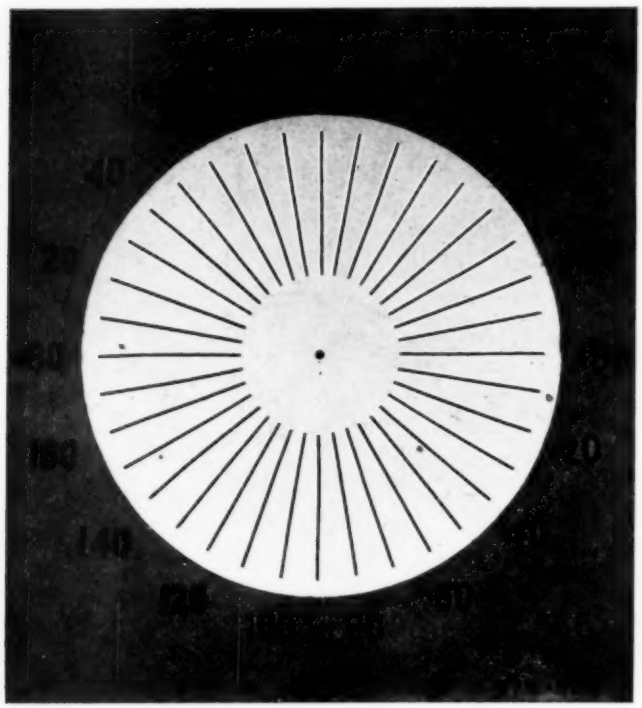

Fig. 4. Chart A modelled after Lancaster's chart.

Since F_1 is a small fraction of a meter and A, in the case in point, a fraction of a diopter (we are dealing with small degrees of astigmatism), the product F_1A will be a very small fraction indeed and may be neglected from the denominator without introducing an error of more than 10%, even in the case of a camera of medium focal length. The equation thus reduces to:

$$X = \frac{F_1{}^2A}{1} = F_1{}^2A.$$

Then by similar triangles, neglecting the small error introduced by the fact that the pupil lies a short distance in front of the posterior principal plane of the eye, and the still smaller error of counting here F_2 to be equal to F_1:

$$\frac{d}{X} = \frac{P}{F_1};\ d = \frac{PX}{F_1}$$

Substituting the value for X obtained above

$$d = \frac{PF_1{}^2A}{F_1} = PF_1A$$

To determine the size of the image in the absence of astigmatism, the familiar formula is used:

$$\frac{\text{h (image size)}}{\text{O (object size)}} = \frac{F_1}{\text{L (object distance from anterior focal point)}}$$

$$h = \frac{OF_1}{L}$$

Finally the desired proportion:

$$\frac{\text{Width of diffusion area}}{\text{Width of clear image}} = \frac{d}{h} = \frac{\frac{PF_1A}{OF_1}}{L} = \frac{PAL}{O}$$

Since $\frac{O}{L}$ is the measure of the visual angle, a, subtended by the object, we may write:

$$\frac{\text{Width of diffusion area}}{\text{Width of clear image}} = \frac{PA}{a}$$

In testing, therefore, for a given astigmatism A, beside the shade of the background two factors are within the control of the examiner—the diameter of the pupil, P, which should be made as large as possible; the visual angle, a, subtended by the elements of the chart, which should be made as small as possible.

Before coming to a final decision regarding the construction of the charts, one additional controllable factor must be determined, namely, the intensity of illumination under which the chart is to be seen. Drs. Ferree and Rand[1] have shown that visual acuity falls off markedly under low illuminations, but that the loss of acuity suffered by persons having even a small degree of astigmatism is much greater than is that suffered by normals. Their tests were made without control of the size of the pupil; it is, therefore, impossible to say whether the whole or only a part of this disadvantage suffered by the astigmatic eye in dim light is due to the enlargement of the pupil. The fact remains that the astigmatic eye is at a special disadvantage in low illuminations, and therefore, that with low illumination small degrees of astigmatism are more easily detectable. On the other hand, very dim lights unduly fatigue the patient and are not practicable for office work. As a compromise, an illumination of 1 to 3 foot-candles was decided upon.

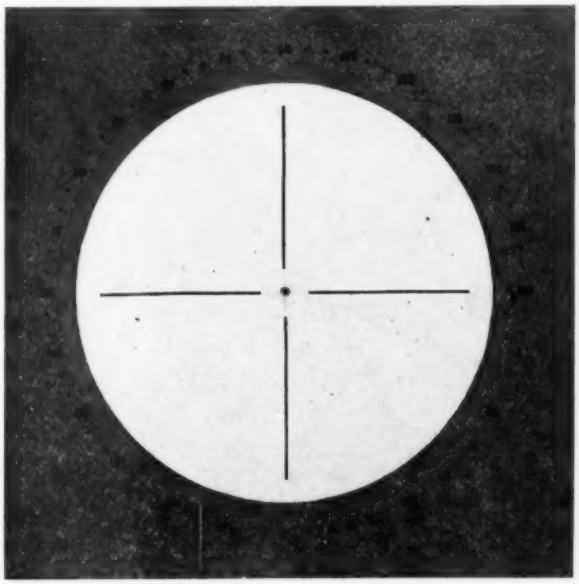

Fig. 5. Chart B modeled after Verhoeff's chart.

In order to have standard reproducible shades Herring papers* were used. A disc was made half of "Herring black," half of "Herring mat white," revolved at high speed, and under appropriate illumination was compared with various "Herring grays." Number 5 was found to give the best match. To determine the width of the elements of the chart, strips of black bordered with white were viewed against the gray background by several observers. That width (2.3 mm. black bordered on each side by 1.15 mm. white) was chosen which was just clearly visible at 6 meters distance by observers whose vision was 6/6. The exact form of the charts constructed

*Obtained from Stolting & Co., Chicago.

with the given specifications might well be left to the taste of the user. Indeed, letter charts constructed on these principles might prove highly useful. The writer has modeled his charts (A and B) after those of Lancaster[2] and Verhoeff,[13] since these seemed to be the simplest and best so far devised. In addition, chart C was made, following the suggestion of Sheard[4], in the hope that by having the lines made of separated square dots, the sensitivity of the charts might be still further enhanced. This chart, however, as will be seen in the illustrations, proved most unsatisfactory.

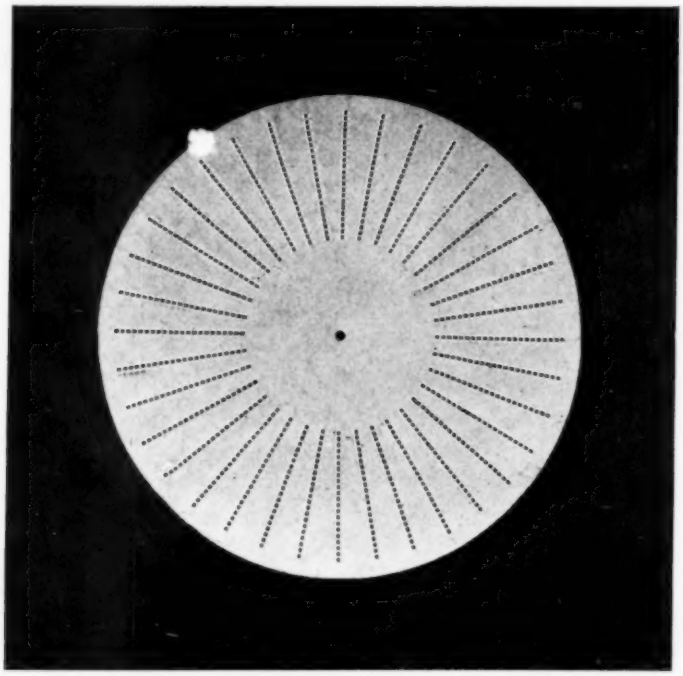

Fig. 6. Chart C, the lines consisting of separated dots, as suggested by Sheard.

Illustrations Nos. 8 and 9 represent the ratio of $\frac{\text{width of diffusion area}}{\text{width of clear image}}$ for the charts as seen at 6 meters distance by an eye with a 5 mm. pupil and a myopic astigmatism of 0.25 D. and 0.12 D. respectively.*

In order that the image in the eye of the emmetropic reader viewing the illustrations should be identical with that of the astigmatic patient viewing the charts, the illustrations should be held far enough away so that the reader can still just resolve the black and white components of the clear lines. He will then be able fairly to compare the sensitivity of the author's charts with that of the Wallace and Lancaster charts photographed with them.

The question of the size of the pupil requires further discussion. As has long been known, the sensibility of the patient of his own astigmatism is di-

*Fig. 8 was taken at 4 M distance with a camera of focal length 24 cm. thru aperture F 16, namely 15 mm. in diameter, and a cylinder +0.12 D ax. 180°. To find what astigmatism of an eye at 6 M distance and with a 5 mm. pupil corresponds to this picture we have only to equate the ratios of $\frac{\text{width of diffusion area}}{\text{width of clear image}}$ for the two cases, using the formula derived above: $\frac{P_1 A_1 L_1}{O} = \frac{P_2 A_2 L_2}{O}$, O being the same for both cases. Substituting: 15 mm. × 0.12 D × 4 M = 5 mm. × A_2 × 6 M. A_2 = 0.25 D.

Illustration Fig. 9 was taken at 4 M distance with the same camera, and cylinder this time axis 165°, aperture 7.5 mm., giving an equivalent for the eye of 0.12 D astigmatism. In preparing the photographs for publication they have been reduced in size. This, of course, does not alter the ratio on which we have based our calculations.

rectly proportional to the size of his pupil. There seems little doubt that the enlargement of the pupil under cycloplegic drugs accounts for some part of the advantages of cycloplegic refraction. The writer suggests that in presbyopes and others for whom cycloplegia is undesirable, refraction would be much simplified by the use of some such drug as euchatropine which produces temporary mydriasis without cycloplegia. He would *not* be taken to suggest the use of mydriatics in cases of glaucoma where those drugs are directly contraindicated.

In refracting with these charts the writer uses the usual fogging procedure. The strongest plus or weakest minus sphere is placed before the patient's eye with which he can still see clearly one or more lines on chart A. Chart B is now set so that one of its lines is in the meridian of the most clearly seen line on chart A. Minus cylinders are then added

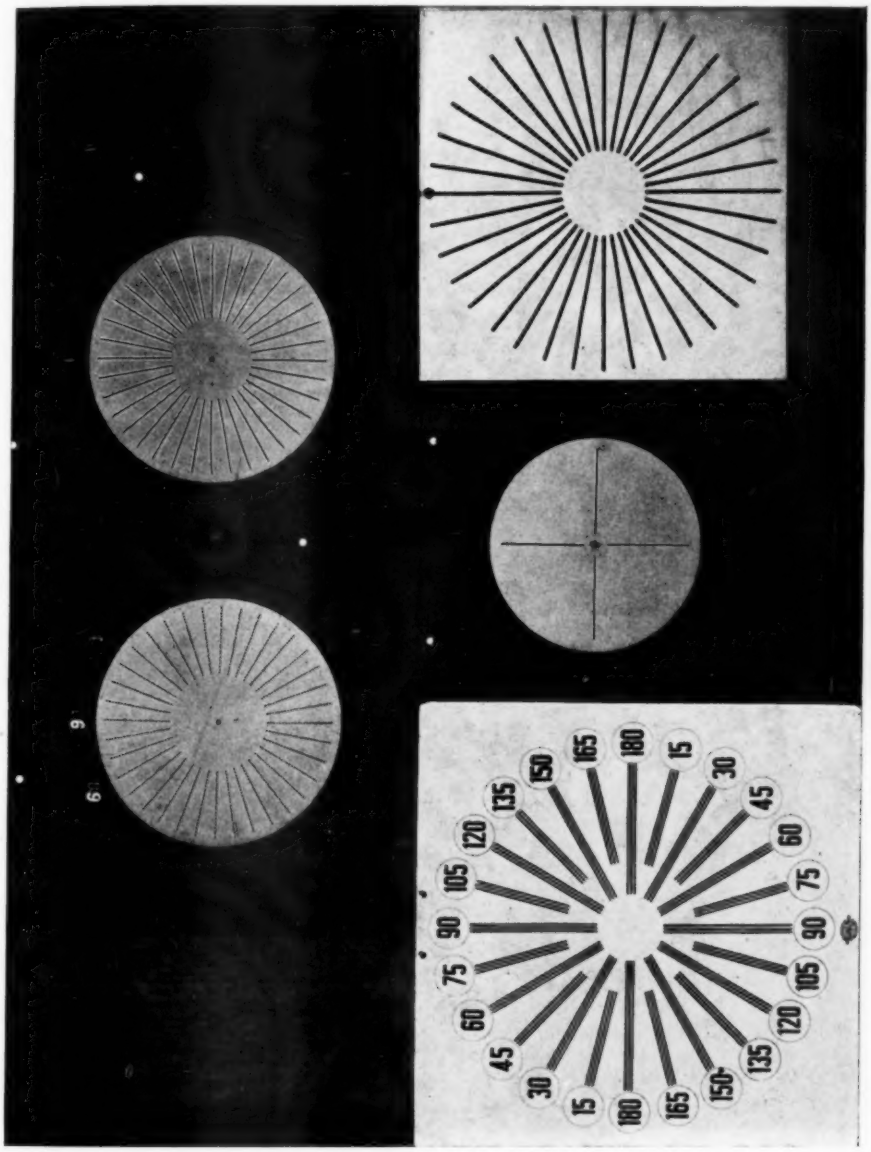

Fig. 7. Group of charts photographed thru an anastigmatic lens.

with their axes at right angles to this meridian until no difference can be detected by the patient in the lines of chart B. The use of chart B during this procedure instead of A greatly simplifies matters for the patient, in that he has only two lines to compare. He is now referred back to chart A for final details in the correction of the astigmatism, and to an ordinary letter chart for the spherical correction.

The use of these charts has very forcibly brought to the writer's attention the fact that low degrees of irregular astigmatism are extremely prevalent. For example, a patient having an hyperopic astigmatism stated, when a +0.37 cyl. axis 90 was placed before his eye, that all the lines appeared equally clear except those at 170°, 180°, 10°, which were very dim (see figure 3, a). With a +0.50 cyl. axis 90°, the vertical and horizontal lines were equally clear but there were four gray patches in the intermediate positions.

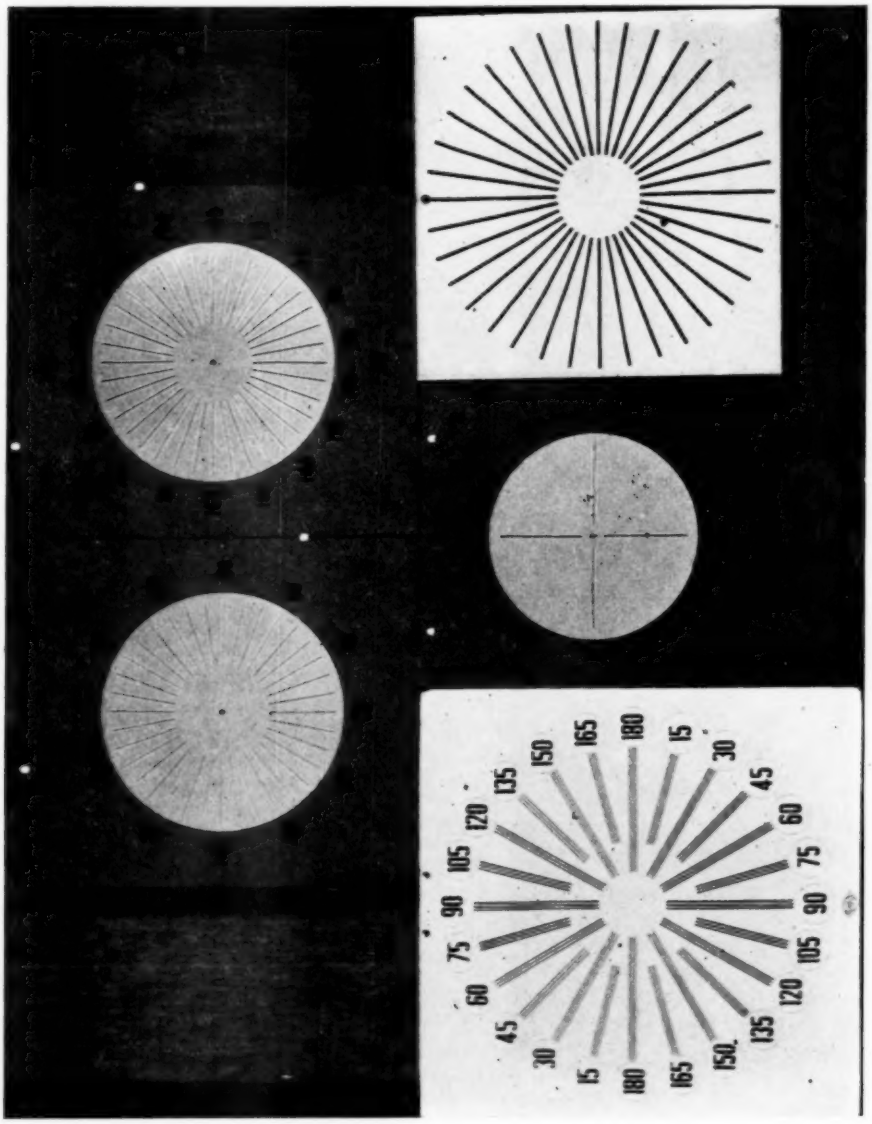

Fig. 8. Group of chart photographed thru lens and aperture combination equivalent to a myopic astigmatic eye, —0.25D.

Conclusion. Theoretic considerations, however, cannot determine the practical value of any device. The crucial experiment is its efficiency in daily use. The writer can only say that he has found these charts of no inconsiderable aid in refracting cases whose visual acuity was good, whose astigmatic error was small, and whose intelligence was not below par.

The writer wishes to express his indebtedness to Dr. Monroe of the Laboratory of Physiological Optics, University of Pennsylvania Post-Graduate School of Medicine for much technical aid.*

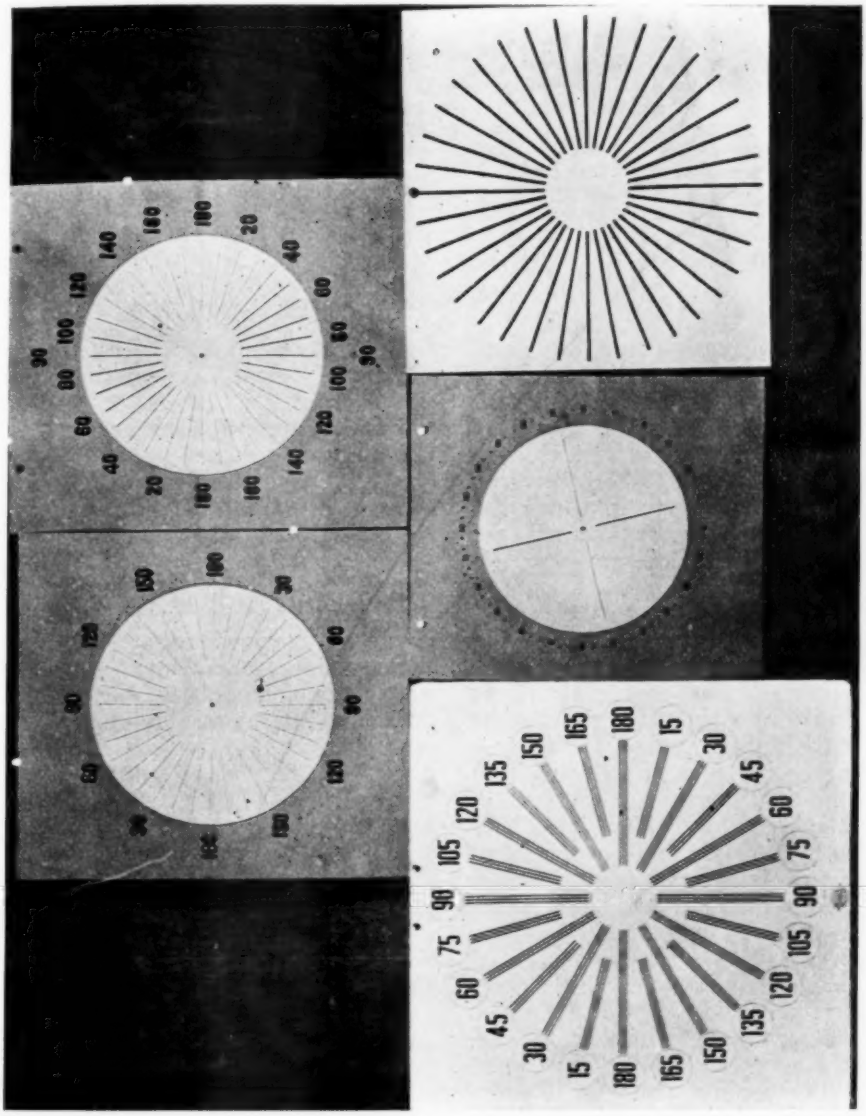

Fig. 9. Same as Fig. 8 but with astigmatism equivalent to —0.12D.

*The charts will be published by Bowen & King, Baltimore, Md.

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1. Trans. Illuminating Engineering Soc., 1920, 9,769.
2. Ophthal Record, 1899, viii, 541.
3. Trans. Amer. Acad. of Ophthal, 1915, xx, 167.
4. Am. Journ. Physiol. Optics, 1923, Vol. 4, p. 163.

THE ASSOCIATED MOVEMENTS OF THE EYES THEIR NERVE CENTRES, CONDUCTING PATHS, PRODUCTION, VARIETIES AND DERANGEMENTS.

ALEXANDER DUANE, M.D.

NEW YORK CITY.

The general relations of the associated ocular movements to the nerve tracts and centres concerned in producing them are here considered under these principal divisions: The supranuclear apparatus and the movements it produces. Association centres in cerebral cortex and movements with which they are concerned. The association pathways connected with the cerebellum and labyrinth. The descending paths connecting the centers with the nuclei. The functions of the centers as to origin and varieties of movements produced. The role of inhibitory impulses in regard to associated movements is taken up. Unicentral and bicentral movements, varieties of associated paralysis, paralyses that are essentially unilateral and paralysis of bilateral movements are discussed.

In spite of the enormous amount of experimental and pathologic data bearing on the genesis of the eye movements and their disorders, our knowledge of the nerve pathways concerned is still far from complete. Even with regard to conjugate lateral movements, which have been so abundantly studied, there is no agreement as to the way in which the terminals of the pathways reach the nerve nuclei[2] (four different arrangements have been suggested, see Lutz[1]); and still less is known as to the centres and terminals for the stimuli producing up-and-down movements, convergence, and divergence. The present statement does not attempt to give all the various views or the arguments for and against each, but rather to present the conception that seems to the reviewer at present most probable. In making it he has drawn very largely from the excellent conspectus of Lutz[1], and from the vast, if somewhat inchoate and undigested, collection of facts amassed by Wilbrand and Saenger.[2]

The conclusions here tentatively made are represented in Figure 1, which shows the arrangement of the supranuclear paths as worked out by Lutz,[1] and of the nuclear connections for the external muscles of the eye, essentially as found by Bernheimer.

Lutz's arrangement differs from that given by Wilbrand and Saenger, in the following regards:

(a) The descending paths from the cortex do not enter a lower association centre, to reach the oculomotor and abducens nuclei, but pass to these nuclei directly.

(b) The branch to the right internal rectus goes to the left oculomotor nucleus, and from this crosses to enter the right third nerve. According to Wilbrand and Saenger, this branch goes to the left association nucleus, thence crosses to the right oculomotor nucleus, and from this enters the right third nerve. Lutz's arrangement, it will be observed, agrees with that found by Bernheimer.

Bernheimer's theory that the nerve centres for the interior muscles (subserving accommodation and the movements of the pupil) occupy the median nuclear masses common to the two oculomotor nuclei has been questioned and probably with reason; but his conclusions regarding the arrangement of the special nuclei for the exterior muscles of the eye, as depicted in the figure, seem in the main to hold.

THE SUPRANUCLEAR APPARATUS AND THE MOVEMENTS IT PRODUCES.

The supranuclear apparatus for effecting eye movements comprises, first, the centres in the cerebral cortex with their interconnections and descending paths; and, second, the vestibulo-cerebellar connections and efferent paths.

The motor impulses sent out by this apparatus are all associated, i.e., they affect the two eyes simultaneously and equally, so as to produce movements of both eyes simultaneously to the right, left, up, down or obliquely, or to make both eyes converge or diverge to an equal extent.

Dissociation of the eyes, so that either can move independently of the other, occurs only in blind or as yet undeveloped

eyes, or as a pathologic rarity; and even then the dissociation is often apparent, not real. The only exception is the ability possessed by most to wink one eye, making its lid elevator act independently of the other. For this reason disturbances of the supranuclear mechanism uniformly act to produce disturbances of associated movements—never paralysis of the isolated muscles. The only exception is the rare isolated central ptosis —an exception which doubtless has some relation to the fact just signalized, that it is possible physiologically to dissociate the activities of the levators of the two lids.

The associated movements produced comprise:

A. *Conjugate* (parallel, or direction) movements, otherwise called versions. In these both eyes follow at equal rate an object moved in a frontal plane. Strictly speaking, in order to eliminate movements of convergence and divergence, the object in testing a conjugate movement should be carried, not along a plane, but along a horopteric circle, i.e., a circle passing thru the object and the centres of rotation of the two eyes. In this case the two eyes in following the object will always converge to the same amount. The versions comprise side-to-side movements (lateriversion including dextroversion and levoversion), up and down movements (sursumversion and deorsumversion) and oblique movements.

B. Fore-and-aft, or *disjunctive* movements. These comprise convergence and divergence.

As will be noted later, a much better classification, inasmuch as it corresponds more closely to physiologic and clinical facts, is that into unilateral and bilateral movements.

ASSOCIATION CENTRES IN THE CEREBRAL CORTEX.

The centres for the cerebral cortex, having to do with the association movements are:

1. The *frontal centres* (*F.*, Fig. 1). Experiments and pathologic data indicate that the chief motor zone for conjugate and probably other associated movements is situated in the frontal lobe, probably about at the base of the second frontal gyrus, and that its efferent paths (*n*, Fig. 1) descend thru the internal capsule and cross over to the opposite side where, in great part at least, they enter the posterior longitudinal bundle and, ascending and descending (*q*, *r*,) in this, reach the third, sixth, and probably fourth nerve nuclei.

Stimulation applied to this zone has the following effects:

Stimulation Applied to	Unilateral Stimulation	Bilateral Stimulation
Upper portion of zone	Deflects both eyes down and to opposite side and depresses lids.	Deflects both eyes straight down and depresses lids.
Lower portion of zone	Deflects both eyes up and to opposite side and raises lids.	Deflects both eyes straight up and raises lids.
Midportion	Deflects both eyes to opposite side.	Makes eyes assume primary position or converge somewhat (eyes being previously diverged under anesthetic).

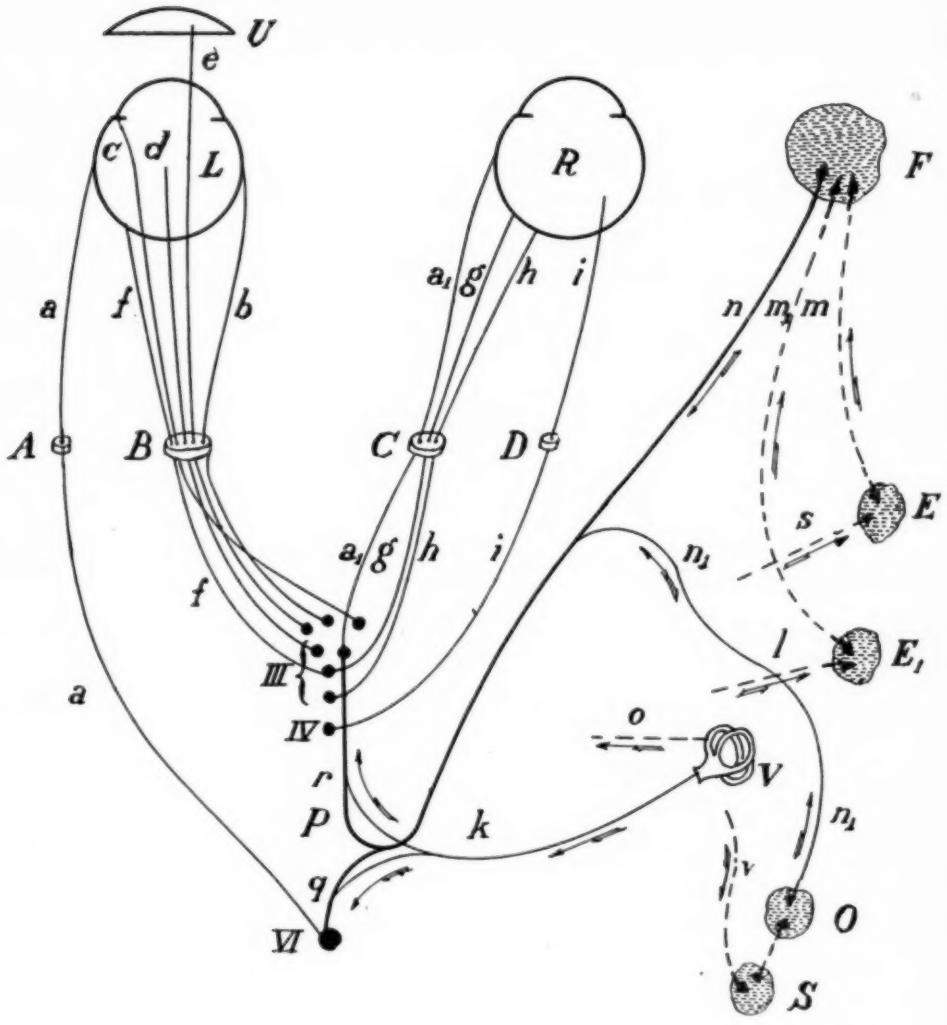
A purely lateral movement is thus secured by a unilateral (monocerebral) stimulation; while a purely vertical movement, or one of convergence can be had only by a bilateral (bicerebral) stimulus. The clinical bearing of this fact will be touched on later.

2. The *occipital centres* (*O*, Fig. 1). These apparently lie on the median, lateral and tentorial surfaces of the occipital lobe, close to the visual centres. Stimulation of this region produces the same effects as stimulation of the frontal cortex; i.e., according to situation a unilateral stimulus produces a purely lateral, or a combined vertical and lateral, rotation of the eyes with corresponding movements of the lids; and a bilateral stimulus produces a purely vertical rotation, or makes the two eyes assume either the primary position, or a position of slight convergence.

The afferent paths for these centres are the visual fibres (*v*, Fig. 1) ascending thru the optic radiation to the primary visual centres (*S*) round the calcarine fissure.

The efferent path (n_1, Fig. 1) descend thru the optic radiation and probably join the descending paths (*n*) from the frontal centres, so that the two unite and then decussate as one.

It has been demonstrated that the occipital centres are completely independent



CENTRES AND PATHS FOR ASSOCIATED MOVEMENTS.

Fig. 1. *A*, section of left 6th nerve; fibres all derived from left abducens nucleus, *VI*. *B*, section of left, and *C*, section of right third nerve, showing in each case only the fibres derived from the left oculomotor nucleus (*III*). *D*, section of right fourth nerve; fibres derived from left trochlear nucleus, *IV*. *E*, E_1, motor centres in right temporal cortex, receiving afferent fibres, *s*, from the left fifth nerve, and *l*, from the left labyrinth, and transmitting the impulses thus received along the paths *m*, m_1, to the right frontal centres, *F*. *n*, descending path from *F*, crossing over to left side and dividing there in the posterior longitudinal bundle, *P*, into an ascending branch, *r*, going to *III*, and a descending branch, *q*, going to *VI*. *S*, visual centre in right occipital cortex, receiving visual impressions through the optic radiation, *v*, and transmitting impulses for movement to the occipital motor centres, *O*. From the latter, the descending path, n_1, joins *n* before its decussation. *V*, labyrinth on right side sending efferent fibres, to the temporal lobe on the left side (corresponding to the fibres, *l*, on the right) and efferent fibres, *k*, which cross over to the left side to *P*, and like *n* divide into ascending and descending branches to *III* and *VI*. *L*, left eye. *R*, right eye. *U*, left upper lid. *a*, *a*, fibres to left external rectus originating in *VI* and representing the continuation of *q*. a_1, a_1, fibres to right internal rectus, crossing over from the partial nucleus (abducens nucleus) in *III* and representing the continuation of *r*. These fibres subserve conjugate movement only (movement of right eye to left in parallelism with left eye). *b*, fibres from partial nucleus (convergence nucleus) in *III* going to left internal rectus and moving right eye to left in movements of convergence only. For the sake of greater clearness, the convergence and abducens nuclei are here represented as distinct. It is quite possible, however, that actually they may be merged, the terminals only being different. *c*, fibres to left suprior rectus. *d*, fibres to left iris and ciliary muscle. *e*, fibres to left levator palpebrae. *f*, fibres, few in number, to left inferior oblique. *g*, fibres, many in number, to right inferior oblique. *h*, fibres to right inferior rectus. *i*, fibres to right superior oblique.

of the frontal, but that the latter are far more powerful, so that if equal opposing stimuli are applied to the two the frontal predominate.

3. *Temporo-parietal Centres* (*E.* E_1, Fig. 1). These have been located in the supramarginal, superior temporal and angular gyri. But experimental and clinical evidence shows that these centres are but way-stations on the afferent sensory paths crossing from the labyrinth, the cerebellum and the region supplied by the trigeminus, and transmit the impulses received from these quarters to the frontal and probably in part also to the occipital centres (Cf. Fig. 1, *l*, *s*, and *m*, m_1).

ASSOCIATION PATHWAYS CONNECTED WITH CEREBELLUM AND LABYRINTH.

Because of the interconnections of the labyrinth and the cerebellum, the relations of these two organs with the association paths for eye movements should be considered together. It seems clear that *direct* fibres (the vestibulo-ocular) pass from the labyrinth to the posterior longitudinal bundle, and there ascend and descend to the nuclei of the third, fourth and sixth nerves. According to the view of Ramon y Cajal, which seems the most probable, these fibres cross completely to the posterior longitudinal bundle of the opposite side (*k*, Fig. 1), thus pursuing a course quite like that of the decussating fibres from the cerebral cortex (Lutz).

These vestibulo-ocular fibres, in part at least, enter Deiters' nucleus before passing to the posterior longitudinal bundle. According to Langdon and Jones[3], those that do so emanate from the horizontal semicircular canal, whereas those from the vertical canals ascend to the middle of the pons and thence pass to the posterior longitudinal bundle.

The *indirect* connections of the labyrinth and cerebellum with the association paths are not so well known. Lutz, summarizing the facts, says that (1) the labyrinth sends afferent fibres (Fig. 1, *o* and *l*) to the temporal centres (angular gyrus, E_1), and thru these by association fibres, m_1, to the frontal and occipital centres. (2) The cerebral cortex, and especially the visual centres, send afferent fibres to the cerebellum, passing first thru the gray matter of the pons and then thru the middle cerebellar peduncles. According to Ramon y Cajal, collaterals which these fibres receive from the pyramidal fibres represent intermediaries in the efferent paths of the proprioceptive systems having to do with conscious muscle sense. (3) Thru its inferior peduncles the cerebellum receives afferent fibres from the vestibule, the spinal cord, and the olive. (4) The superior cerebellar peduncles are efferent paths, having to do with the maintenance of muscular coordination. The researches of Langdon and Jones, based on over 600 clinical cases and many autopsies, indicate that the indirect (or vestibulo-cerebello-cerebral) fibres pass from the horizontal semicircular canal thru the inferior cerebellar peduncle, and from the vertical canals thru the middle cerebellar peduncle to the cerebellum of the same side; and thence to the cerebral cortex of both sides (according to Mills especially to the second temporal gyrus). The views of these authors and of Lutz seem not essentially different, altho Lutz pictures the indirect vestibular paths as going, in part at least, to the temporal cortex directly instead of by way of the cerebellum. Another view, quite conjectural apparently, is that of Willenberg, cited by Wilbrand and Saenger. He suggests that the indirect fibres from labyrinth to cortex may run to the latter from the posterior longitudinal bundle.

DESCENDING PATHS, CONNECTING THE CENTRES WITH THE NUCLEI.

From what has been said it is evident that the great avenue connecting the various centres with the nerve nuclei is the posterior longitudinal bundle. With this are merged the descending paths from the frontal and occipital centres (*n*, n_1 Fig. *1*), and the vestibulo-ocular fibres (*k*) coming directly from the labyrinth. Indirectly it receives impulses derived from the labyrinth and the cerebellum (along *l*, Fig. *1*), and from the trigeminus (*s*), which are conveyed first to the temporal lobe and thence thru the association paths *m*, m_1, to the frontal and probably the occipital centres.

The most probable view is that the direct fibres n_1 n_1, k all decussate completely to enter the posterior longitudinal bundle, so that all the fibres from the right cortex and the right labyrinth go to the nuclei of the left side (see Fig. 1). The indirect fibres for the most part decussate twice, going first to the cortex of the opposite side (l, s), and then back thru m m_1, n to the posterior longitudinal bundle of the same side.

There must, however, be other points of entry to the nuclei beside the posterior longitudinal bundle, since lesions of the latter affect lateral movements only—not movements of elevation, depression, convergence, and divergence. The paths for these latter associated actions are unknown, but the cerebral centres for them and the descending paths as well must be bilateral. This is inferred not only from the experimental evidence already adduced, but also from the fact that unilateral cortical and subcortical lesions do not cause abolition of these functions.

Many authors have thought that the efferent paths from the cortex and labyrinth must enter *subcortical association centres* before they enter the nerve nuclei. Thus it is thought that the paths for lateral associated movement must enter such a centre, which is close to, but not identical with the abducens nucleus, and from which the terminal fibres to the abducens and oculomotor nuclei emanate. But as Lutz says, in agreement with Spiller and others, the existence of such a centre has never been demonstrated, nor does it seem necessary, the arrangement indicated in Figure 1 (ascending and descending branches r, q,) answering all requirements.

As little does it seem necessary to predicate the existence of a terminal (basal) association centre for up-and-down movements, for convergence, or for divergence.

FUNCTIONS OF CENTRES; ORIGIN AND VARIETIES OF ASSOCIATED MOVEMENTS PRODUCED.

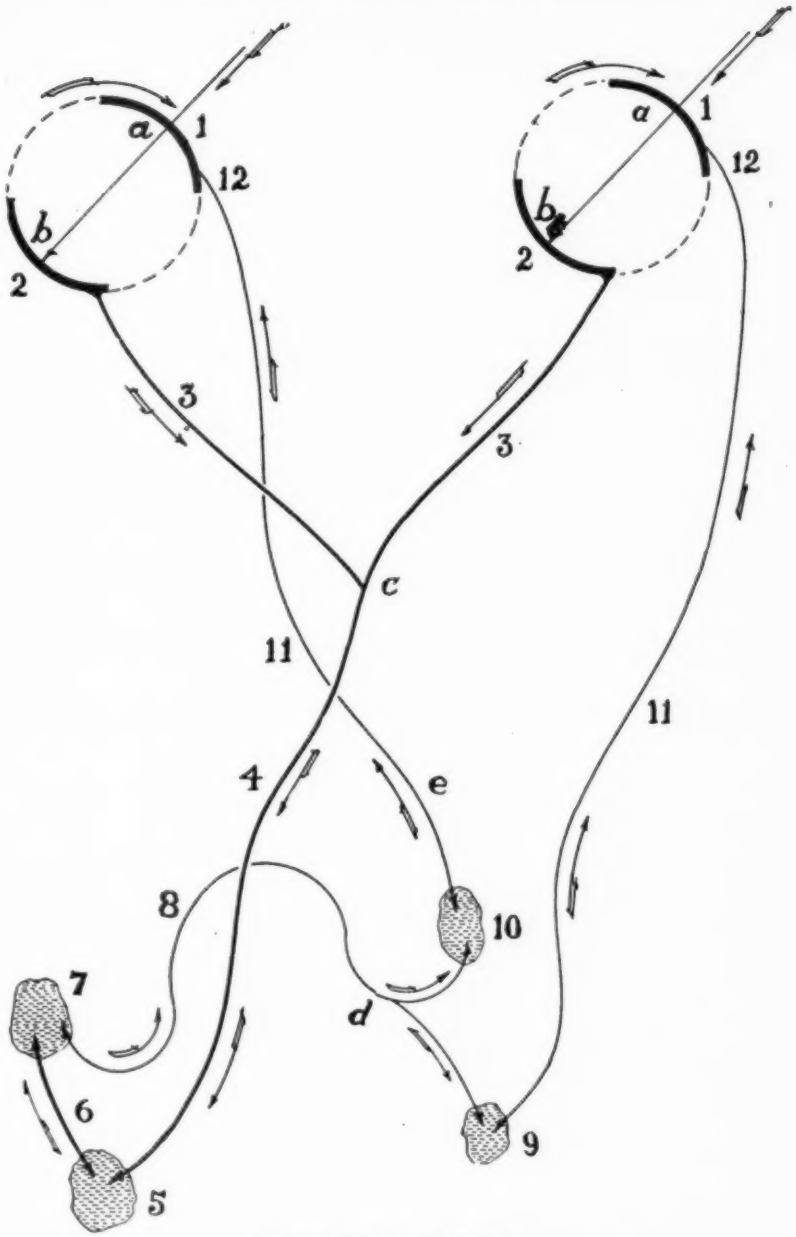
1. The *occipital centres* (O, Fig. 1) respond to visual stimuli transmitted thru the optic radiation (v) to the visual centers (S) of the calcarine cortex. The movements thus induced may be conjugate, convergent, or divergent, and comprise fusion and attraction movements.

Fusion movements are those which compel the eyes to fuse double images, and thus secure binocular fixation as well as binocular single vision.

Even in the very earliest months of life, the condition in which an object forms its image on the fovea in one eye and elsewhere in the other, evidently gives rise to disagreeable sensations which are instinctively avoided. The commonest way of effecting this is by setting up—in all probability thru the occipital motor centres*—a movement, regularly one of convergence or divergence, by which the image is brought on the fovea in each eye. Sometimes when for one reason or another this fusion movement is impossible to make or maintain, the difficulty is obviated in another way, i.e., by a *disjunctive* or contrafusional movement, separating the eyes and hence the images still more widely. This is, again, a movement of convergence or divergence, which is also set up in all probability by the occipital visual centres, but the stimulus for which is in this case one of inhibition instead of excitation.

The *attraction* movements are those set up by the effort to turn the eye toward an object, the image of which in the periphery of the retina excites attention. These attraction movements are set up by the mechanism indicated in Figure 2, which shows how an object on our right produces a visual impression on the left half of each retina, which impression is conveyed to the left cortex, and then converted into a motor stimulus which, more or less automatically, swings both eyes to the right, i.e., toward the object. Such a movement is doubtless intensified

*The view formerly enunciated by Wilbrand and Saenger that fusion movements are produced by visual stimuli going directly from the optic nerve to the anterior corpora quadrigemina, instead of taking the usual path of visual stimuli and going to the occipital centres first, seems to the reviewer to introduce a reflex mechanism which is not needed to explain the movements and for which there is no clear evidence. Altho it is not definitely so stated, one would judge from words used in a portion of the same work (Vol. VIII, p. 8) issued some years later, that the authors themselves have given up this view. For they say that the fusion movements, altho even less under the influence of the will than the attraction movements, belong in the same category as the latter, the stimulus for which, as they concede, passes thru the cortical centres for vision.



LEFT VISUAL TERMINAL.

Fig. 2. The drawing represents one of the two forked terminals, by the fusion of which the two eyes are constituted. 1, 1, the lens terminal, i.e., the right half of the anterior portion of each eye. Rays of light emanating from an object on the right take the course *ab* in each eye, thus crossing over from 1, 1, to impinge on 2, 2, the left brain terminal, i.e., the left half of the retina in each eye, 3, 3, the corresponding fibres of the optic nerves (direct fibres from the left retina, decussating fibres from the right). These meet at the chiasm, *c* (sensory semidecussation) and are continued in the left optic tract and optic radiation, 4, to reach the visual centers, 5, in the left occipital cortex. From here the impression passes along the path 6, to the left motor centres, 7, and thence descends along 8. At *d*, they cross over to the right side (motor decussation) and divide into descending and ascending branches going respectively to the right abducens nucleus, 9, and the right oculomotor nucleus, 10. The efferent fibres, 11, 11, from these nuclei pass forward, that from 9, continuing on the same side, but that from 10 crossing over (motor semidecussation, *e*). These fibres supply the right external and the left internal rectus respectively (12, 12). The motor stimulus thus sent down from 7, and which originates in a sensory impulse coming from the right side, contracts both these muscles and swings both eyes (or rather both lens terminals of this single fork) to the right, i.e., toward the object which created the visual impression (attraction movement). If the light stimulus impinging on 2, 2, is excessive or otherwise disagreeable, the motor stimulus sent down from 7 is an inhibitory one, causing active relaxation of the right externus and left internus, so that both eyes swing to the left (avoidance movement).

by the increasing distinctness, and hence attractive power which the object gains, as in the course of the rotation of the eye its image nears the fovea; and when the image actually falls on the fovea, the eye is kept from rotating any further by the fact that, if it begins to do so, the object at once appears less clear.

A similar mechanism secures the fixation of a near object by convergence. Such an object, when we are looking past it, forms an image on the temporal side of each retina, and if it sufficiently excites the attention, will set up a stimulus that will be transmitted to the occipital centres on both sides and turn each eye nasally.* (Cf. the effects, already cited, produced by bilateral stimulation of these centres in animals.) Here, again, as soon as the image of the object falls on the fovea of each eye, the process of convergence will be automatically checked, because any continuance of it would make the object appear less distinct and also double.

By a like bicerebral process, probably largely an inhibitory one, divergence of the eyes in order to fixate a more distant object will be effected.

If the object that excites the attention repels by its excessive brightness, or from any other cause, the movement of attraction is replaced by a movement of *avoidance*, carrying the eyes away from the object. Here the paths and centres are doubtless the same, but the impulse sent down from the cortical motor centres is one of inhibition instead of excitation.

Sometimes, when the eyes are *apparently unable to make an attraction movement*, i.e., to turn in a given direction in order to fix a peripherally located object, they still can turn in this direction if the image of the object is first made to fall on the fovea and is then displaced toward the periphery of the retina. This may be effected in various ways. Thus, in a case in which an eye apparently cannot move at all to the left, it may do so if, when it is sighting an object straight ahead, a strong prism is placed before it with the apex directed to the left, (*Grafe's prism test*). In making this test either a prism of the same strength and similarly directed should be placed before each eye, or else a prism placed before one eye and a screen before the other; in either case, both eyes will be seen to move toward the apex of the prism. So, too, eyes apparently powerless to look to the left, may nevertheless follow an object which is first placed in front of the eyes and then gradually carried to the left (*following movement*). Or, by a quite similar gradual movement, they may maintain fixation on an object which is kept still while the head itself is being slowly rotated to the right (*reptant fixation*). In this case the eyes can still maintain fixation after the head has been rotated as far as can be. Of a different nature is the movement made when such a patient sights a fixed object straight ahead of him, and the head is passively rotated by a sudden jerk to the right. Then the eyes may turn to the left to fix the object, but directly after return by a wavy movement to the original position (*resilient fixation*). The three tests last named are given as described by Bielschowsky (cited by Wilbrand and Saenger). The terms "reptant" and "resilient" fixation, however, are my own.

The significance of these different variants of the normal attraction movement will be considered later.

2. The *frontal* lobes are the centres for *willed movements*. They also respond to auditory and sensory impulses transmitted from the temporal lobe, and derived from the fifth nerve, the labyrinth and cerebellum (Lutz and others). Thus we are led to turn our eyes in the direction of a sound that excites our conscious attention; or of an impression received from the trigeminus (denoting superficial sensation); or in response to a vestibular stimulus conveying impressions derived from the proprioceptive nerves of the ocular and head muscles (musculo-sensory impressions).

It must be observed that the frontal centres for eye movements are close to the centres for the corresponding movements of the head, and a sensory stimulus producing movement regularly af-

*It must be noted that, for reasons already stated, the efferent path corresponding to this bicerebral impulse cannot be that shown in Figures 1 and 2, i.e., cannot pass thru the posterior longitudinal bundle. The like is true of the descending paths called into play in an up or down attraction movement, or in a movement of divergence.

fects both these centres at once, so that the head and eyes move in the same direction simultaneously, or the movement of the head may even precede that of the eyes by a slight interval. Corresponding to this constant normal association of head and eye movements is the pathologic association by which a conjugate deviation of the eyes is accompanied by a similar deviation of the head.

3. The *temporal* centres act simply as intermediaries, forwarding sensations and impressions of various kinds to the frontal and probably also the occipital lobes. Lutz suggests that the connections of the angular gyrus with the pulvinar, on the one hand, and the anterior and posterior cortical centres, on the other, would explain the fast and slow movement in labyrinthine nystagmus. For his explanation we refer to the original.

4. The *labyrinth* sets up purely *reflex associated movements.* The labyrinth is itself connected with the proprioceptive nerves subserving muscle sense and derived from the muscles of the eye and neck. The stimuli set up by contraction of both sets of muscles, together with purely vestibular stimuli set up by changes of pressure in the semicircular canals due to varying postures of the head, are conveyed to the basal motor nuclei either directly (along *k*, Fig. 1) or thru the intermediation of the temporal and frontal centres (along *l*, m_1, and *n*). Impulses from the labyrinth tend to draw the eyes to the right or left, and a bilabyrinthine stimulus, just as in the case of a bicerebral stimulus, tends to steady the eyes in the primary position and may be the principal agent in maintaining fixation. Disturbances of labyrinthine functions cause a conjugate deviation which is not continuous, but intermittent (labyrinthine nystagmus). In the presence of a cortical or subcortical conjugate paralysis, with intact labyrinth, the eyes should still show labyrinthine nystagmus when the appropriate stimuli are applied. They should also show resilient fixation (see p. 22), whereas the presence of a reptant fixation indicates that the cortical centres, in a measure at least, are functioning (Wilbrand and Saenger, citing Bielschowsky).

5. Little is certainly known of the effect of the *cerebellum* on associated movements. Cerebellar lesions may cause conjugate deviation, and division of the restiform body, which is continuous with the inferior cerebellar peduncle, causes Magendie's symptom, or the condition in which one eye deviates up and out, and the other down and in, the deviation disappearing when the patiet fixes an object (Duval and Laborde cited by Lutz). This symptom is ascribed to interference with the conduction of proprioceptive impulses derived from the eye muscles and the labyrinth. In general we may say, that the cerebellum is so connected with the labyrinth and the cerebal cortex that it is difficult to determine just what effect, if any, the cerebellum alone exerts on ocular movements.

ROLE OF INHIBITORY IMPULSES IN PRODUCING ASSOCIATED MOVEMENTS.

The various centres enumerated discharge impulses, not only of excitation but also of inhibition. In fact, excitation of the centre for one movement is regularly accompanied by inhibition of the centre for the movement opposed, or at least inhibition of the movement itself (Sherrington). For example, a discharge from the right frontal cortex for a willed movement of both eyes to the left, regularly conveys both an impulse of excitation causing the left external and right internal rectus actively to contract, and an impulse of inhibition causing the right external and left internal rectus to relax. So, too, when the eyes are impelled to converge, there is probably a bicerebral impulse of excitation causing both internal recti to contract, and a bicerebral inhibitory impulse causing both external recti to relax. In divergence the reverse takes place.

The existence of such an inhibition in the case of a bifrontal stimulation was demonstrated by Sherrington (Lutz). Sherrington found that if all the muscles moving the two eyes, except the external recti, were divided, a bifrontal stimulation would still make the eyes swing from a position of divergence to one of parallelism or even slight convergence. This convergent movement can be explained only by assuming an inhibition of the external recti, these being the only muscles left to act on the eyes.

We have seen that the excitatory impulses for ocular movements, whether derived from the cerebral cortex or the labyrinth, pass over to the nuclei of the opposite side. This would seem to be also true of the inhibitory impulses originating in the labyrinth (Lutz), while the inhibitory impulses from the cortex, if they follow the descending paths from the latter, must go to the nuclei of the same side. Thus, if the version centre *F* (Fig. 1) in the right cortex were stimulated, it would send down along the path *n* two impulses—one, excitatory, crossing over to the posterior longitudinal bundle, and the nuclei on the left side, and producing an active contraction of the two levoverters; and the other, inhibitory, going to the posterior longitudinal bundle and nuclei on the right side, and producing an active relaxation of the two dextroverters. But there is another possibility, i.e., that the inhibitory impulse from *F* instead of descending along *n*, crosses over to the cortical centre on the left side, and thence descending crosses back to the posterior longitudinal bundle of the right side, to reach the muscles inhibited.

The effect of inhibitory impulses in causing avoidance movements, and also in causing the disjunctive movements employed to obviate the annoyance caused by diplopia, has been already referred to.

UNICENTRAL AND BICENTRAL MOVEMENTS.

From what has already been stated, we may divide the associated movements of the eyes into two classes, unicentral and bicentral.

Unicentral movements are those whose originating impulse starts from a centre on one side only of the brain, whether this centre is frontal, temporal, occipital, or labyrinthine. These movements comprise:

Associated movements to right or left (lateroversion);

Bicentral movements are those produced by stimuli emanating simultaneously from both sides of the brain, or both labyrinths. They include:

Opposed lateral or vertical movements producing fixation in primary position;

Movements straight up or straight down (sursumversion, deorsumversion);

Movements of convergence;

Movements of divergence.

This distinction of movements into one-sided and two-sided, holds, not only for the organ exciting the movement, but also for the organ moved. For a lateral movement to the right, altho it affects both eyes, really affects but a single organ, namely, the forked terminal formed by the right anterior and left posterior half of the right eye conjoined with the similar portions of the left (Figure 2), whereas up-and-down, and convergent and divergent, movements affect not only both eyes but also both terminals.

Lateral movement is thus not only unicentral but also uniterminal, and a bicentral movement is biterminal.

It may be noted that the unilateral (unicentral and uniterminal) and the bilateral movements differ not only in origin and termination, but also in their descending paths. The unilateral movements are transmitted thru the posterior longitudinal bundle, but the bilateral movements must have some other means of access to the nuclei (see ante).

This division of movements into unicentral and bicentral seems justified by both physiologic and clinical data. But it is only partially valid. It may be regarded as true if we consider simply the main effect produced by the movement. Thus, in a lateral movement to the right, the main action is that caused by a stimulus conveyed from the left brain to the right external and left internal rectus. But we know from clinical data that in this movement, simple as it seems, all the muscles of the eyes are involved Apart from the inhibition of the left rotators (left external and right internal rectus) there is active contraction of all the eight elevators and depressors in both eyes. This necessarily involves a bicentral impulse, which may possibly be of equal intensity with the unicentral impulse that starts the movement to the right. Quite as apparent is the bicentral character of the impulse in the oblique movements of the eyes. For example, in looking up and right, while the primary impulse for the oblique movement may start from the lower frontal or lower occipital zone in the left cortex, the stimulus producing the upward movement at least seems to be bilateral, since all four elevators are equally involved. That the stimulus for the upward move-

ment in this case is bilateral appears also from the fact that cortical lesions do not seem to cause paralysis of oblique movements. Theoretically they should do so, if they happend to involve the upper or lower zone in a frontal centre. But a lesion so situated apparently cuts off only the lateral component of the movement, while the vertical component is unaffected; showing, one would say, that this vertical component originates in a stimulus received from the intact side as well as the injured one, while the lateral component originates only in the latter.

In fact, every movement of the eye is due more or less to bicentral stimuli, and all we can say is that, in a lateral conjugate movement, the unicentral stimulus predominates, but bicentral stimuli nevertheless are present; that in an oblique conjugate movement a strong unilateral is combined with a marked bilateral stimulus; and that in vertical movements, and movements of convergence and divergence, the stimlus is purely bilateral.

VARIETIES OF ASSOCIATED PARALYSES.

It is beyond the scope of this paper to consider in any thorogoing way the symptomatology of associated paralyses. Such facts only will be given as bear more or less directly on the facts and theories already presented regarding the motor pathways.

One outstanding fact is that associated paralyses, like the movements which they affect, may be divided into unilateral and bilateral.

Essentially unilateral (and only rarely and by accident bilateral) are paralyses of lateral movement (lateriversion).

Essentially bilateral are paralyses of the bicentral movements, i.e., of the up-and-down movements and of convergence and divergence.

The difference is clinically significant because, to produce a paralysis of a bicentral movement, a cortical lesion or one affecting the paths just below the cortex, would almost necessarily have such a distribution as to produce also a complete paralysis of the lateral movements to both sides, and would very likely be of such extent as to cause great mental hebetude, or coma, and in many cases, death. Hence, a paralysis of up or down movements, or of convergence or divergence, due to a cortical or immediately subcortical lesion, could scarcely be made out. And, as a matter of fact, such paralyses, as far as we know them, are produced by lesions immediately adjoining the nuclei and evidently affecting the afferent paths just as they enter the latter.

PARALYSES ESSENTIALLY UNILATERAL (PARALYSES OF LATERIVERSION).

The paralyses of side-to-side movements (lateriversion) comprise the following varieties:

1. Paralysis of side-to-side movement with retention of convergence. For example, neither eye can move beyond the midline when attempting to look at an object on the right; but the left eye can still move to the right when called on to converge with its fellow.

Such a paralysis may be due to a lesion in the cortex itself, or to one situated in the conducting paths descending from the cortex, or finally in the terminal connections in or adjoining the pons. Several subvarieties may be mentioned:

(a) Altho ordinarily in following an object carried to one side, the in-turning eye cannot pass the middle line, it can do so if the out-turning eye is covered. The in-turning movement, in this case, is held to be simply a movement of convergence (Jeffries, Moebius). If so, it should be possible to eliminate this movement by placing the moving object of regard at a sufficiently great distance.

(b) The patient may be apparently unable to turn his eyes to look at an object situated to one side of him, but still will be able to follow a light if carried very slowly from straight ahead of him to one side (following movement), or may maintain fixation when the head is slowly turned (reptant fixation), or may perform an involuntary movement to effect fixation behind a prism (Graefe's test). (For all these tests see ante.) Such a finding, especially a positive response to the Graefe test, would indicate that the cortical centres at least are functioning, altho the frontal centres for willed movements, either from psychic causes (hysteria) or for other reasons, are in abeyance.*

*Hysteria, however, does not seem to produce paralysis of lateral movements, but only a spasm of convergence (Wilbrand and Saenger). The reviewer, however, has seen paralysis of upward movement at any rate, almost certainly hysterical, due to inhibition of the will. Perhaps these hysterical inhibitions or stimulations may involve only the bilateral movements.

One would infer that these evidences of at least partial retention of cortical activity could scarcely obtain unless the lower terminals in the pons were also intact; but, according to Bielschowsky[5] following movements may still be present in lesions involving these terminals.

(c) The patient is unable to move the eyes to one side at word of command, or in response to ordinary visual stimuli, but can move them when directed to maintain fixation while the head is jerked by a sudden passive movement to one side (Bielschowsky cited by Wilbrand and Saenger). The characteristic feature here is that the eyes, after turning in this way to fixate, do not maintain fixation, but by a more or less jerky movement return to their original position (resilient fixation; see ante). This finding indicates a supranuclear lesion with intact labyrinthine connections.

(d) Paralysis of side-to-side movements in both directions (combined paralysis of dextroversion and levoversion) with retention of convergence. In all the cases of this sort reported in the summary given by Wilbrand and Saenger[6], the lesion was pontine, i.e., such as to involve both association paths at their terminus. Such a paralysis could, of course, also be due to a bilateral cortical lesion, but such a lesion would probably in most cases be so extensive as to cause profound cerebral symptoms masking the conditions.

2. Paralysis of lateriversion, with paralysis of the affected internal rectus for convergence also. This involves a pontine lesion involving the posterior longitudinal bundle, and extending to the oculomotor nucleus, or to the radicular fibres of the third nerve. It is not, therefore, a purely associated paralysis.

3. Internuclear paralysis (ophthalmoplegia internuclearis of l'Hermite). In this either the ascending branch (*r*, Fig. 1), or the descending branch (*q*) of the association tract in the posterior longitudinal bundle, is affected (Lutz). In the former case (ophthalmoplegia internuclearis anterior), the internal rectus of one eye is paralyzed for lateral but not for convergent movement, but the external rectus of the other eye works normally. In the other case (ophthalmoplegia internuclearis posterior) both internal recti function normally, but the external rectus of one eye is paralyzed, and yet the circumstances are such as to indicate that the lesion is neither in the abducens nucleus nor in the fibres of the sixth nerve.

Either the anterior or the posterior form of internuclear ophthalmoplegia may represent a residual stage of an ordinary conjugate paralysis, which in this case evidently was produced by involvement of both ascending and descending branches in the posterior longitudinal bundle. Either form also may be bilateral.

PARALYSIS OF BILATERAL MOVEMENTS.

These include paralysis of up-and-down movements, of convergence, and of divergence.

For the reasons already given, such paralyses, when they can be made out, are caused mainly, if not altogether, by lesions close to the nerve nuclei, and involving the bilateral association paths at their terminal connections with the latter. Bilateral lesions, situated higher up, doubtless may cause them, too, but then the symptoms are so masked that the diagnosis cannot be made.

It may be noted that, just as a paralysis essentially one-sided in nature may occasionally appear on both sides (bilateral paralysis of side-to-side movements, see ante), so a paralysis essentially double-sided may, very rarely, assume a one-sided character. Thus Spiller[7] noted a case of paralysis of associated movements upward, which was first complete; then improved so that the elevators on one side functioned again, the superior rectus on the other side being still paralyzed; and finally was cured altogether.

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ORBITAL EDEMA IN EXOPHTHALMIC GOITRE.

EDGAR S. THOMSON, M.D.

NEW YORK CITY.

Three extreme cases are here reported in one of which both eyes had to be enucleated. The clinical course, symptoms and examination of excised tissues appear to point to the importance of edema of the orbital tissues in producing and keeping up the exophthalmos. Citations from the literature are given in support of the view. Read before the Colorado Congress of Ophthalmology and Oto-Laryngology, July, 1923.

The protrusion of the eyes in exophthalmic goitre is certainly one of the most striking symptoms in this disease. It is of great importance on account of the discomfort which it causes the patient and the danger to his vision. It appears fairly early in the disease and frequently keeps pace with the tachycardia and general depression, increasing steadily up to a certain point and then remaining in that condition. At times it increases rather rapidly, causing first a partial exposure of the lower bulbar conjunctiva, and finally exposure of the cornea or even luxation of the globe. Even where the exophthalmos is not very marked, the conjunctival vessels are apt to become congested and the lymphatic processes in the cornea somewhat impaired, so that an annoying conjunctivitis exists in the one case, and a low grade superficial corneal ulceration which is intractable to treatment, in the other.

These conditions are undoubtedly caused by interference with the circulation at the apex of the orbit—whatever the pathology of the process may be. When the protrusion has advanced so far that the globe cannot be completely covered, we have to deal with the elements of drying and infection of the cornea and, of course, a much worse condition of lymphatic stasis in the orbit, as well as tension on the lid attachments and, as a consequence, pressure on the globe. In many cases the central arterial system of the retina, and the choroidal vessels, seem to show a congestive tendency, but, in my experience, what might be expected in the way of lesions of the posterior pole of the globe do not often occur. It is rather singular that optic nerve changes are not more frequently observed but it is probable that in most cases the nerve adapts itself to the slowly progressing orbital changes, and that in the extreme cases, where the nerve might suffer from undue traction, the appearances are masked by the corneal ulceration.

The lack of symptoms of pressure on the optic nerve would seem to indicate that the process is a very mobile one, extending thru the orbital tissues without any very marked tendency to localization, and pressing forward in the line of least resistance. Severe cases of corneal ulceration are unfortunately not rare, and a number have been reported where both eyes have been lost. In the three cases I wish to speak of, the process was a rather rapid one, and in two, at least, well marked symptoms of edema were present.

CASE 1. Male, Hebrew, 46. Came under my care, August 11, 1914. Since the preceding October his health had been poor, with digestive disturbances and palpitation. Since the early part of June his eyes had been protruding. At this time his pulse was 120, blood pressure 140, R. V.=20/30 w. +1.00 cy. ax. 180°. L. V.=20/30— w. +1.50 cy. ax. 180°.

Both fundi seemed hyperemic, and there was slight tortuosity of the retinal vessels. The thyroid had been gradually getting larger for six years. There were no other points of interest in his family, or personal history.

He grew rather worse under treatment and in January, 1915, was taken to the Mayo Clinic at Rochester. They have very kindly sent me his history which, in brief, is as follows:

He was admitted January 5, 1915, with exophthalmos, tremor, hyperplastic thyroid, enlarged veins right upper chest, heart slightly enlarged to left (X-ray). Urine, 1015, negative; blood pressure 160/60; pulse 130, regular.

January 8th a thyroidectomy was done, with double resection and division of the isthmus and removal of two-

thirds of each lobe. Pathologic report: Hypertrophic parenchymatous thyroid. Weight, 27 gm.

He returned to New York, February 24th, and went back to work, which was administrative in a manufacturing establishment. He was in good health, and his pulse slower, about 95, but he was very nervous and much fretted about the condition of his business.

I saw him May 2, 1915. The exophthalmos was about the same. The right eye had a small yellowish infiltrate of the cornea near the nasal margin, with considerable conjunctival hyperemia and purulent secretion. The left conjunctiva also seemed irritable. The lids

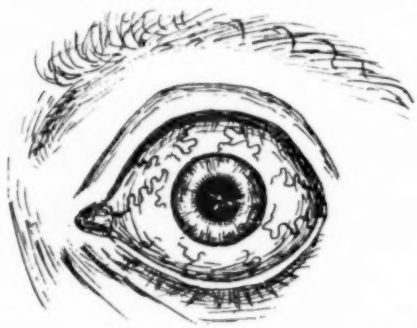

Fig. 1. Stellate opacity of cornea in exophthalmic goitre. Case 1.

and conjunctivae were slightly edematous, a condition he had noticed for about a week. He was treated with argyrol, atropin, hot water applications, and frequent cleansing with boric acid.

He grew steadily worse as regards the edema, tho the corneal infiltrate improved. Both lids on each side became very fat and edematous, and the exophthalmos increased. A large area of edematous conjunctiva appeared between the lids, springing from the globe, below the cornea, and forced its way thru the entire length of the palpebral fissure. Apparently an acute edema had occurred, involving the posterior part of the orbit, lids and the lower part of the bulbar conjunctiva. The movements of the eyes were much restricted and there was a steadily increasing tension in the lid tissues and pressure on the globes.

He was sent to the Manhattan Eye, Ear and Throat Hospital, May 6th, four days later, and a cantholysis was done on both sides and the lids sutured together firmly. The edematous fluid in the conjunctiva could be pressed out with the finger so as to flatten it completely. The sutures cut out in two days, at which time the edematous tissue came out between the lids (like an eel), and while it could be compressed as before, the edema at once reappeared. The corneal infiltrate had almost gone. The lids were again sutured, but after two days the sutures were removed and protection of the cornea was secured by firm strapping with adhesive plaster and bandaging, local antisepsis being, of course, used.

This treatment was continued until early in June. Always when the dressing was removed, a large amount of edematous conjunctiva would be found to have forced its way between the lids, no matter how firmly the adhesive straps were applied. The tension on the lids had greatly improved, and the edema of the lids had subsided slightly. There were no especial changes in his general condition at this time. Dr. S. Beebe was called and advised a serum with adrenalin m. IV internally. May 20th, the exophthalmos measured R, 28, L, 27. A peculiar star shaped opacity had appeared in the corneal epithelium of each eye.

The edema of the conjunctiva grew steadily firmer, and finally on June 12th, in consultation with Dr. David Webster, it was decided to amputate the edematous conjunctiva, which could no longer be compressed. Under local anesthesia a strip of the bulbar tissue half an inch wide and more than an inch long was excised from each eye, and the opening closed with sutures. Healing was uneventful, and he left the hospital June 25th.

Microscopic examination of the excised tissue showed a fairly luxuriant amount of connective tissue, holding a small amount of fluid in its interstices, or in other words, hyperplastic edematous connective tissue. It was remarkable how little this tissue shrank in hardening. The pathologist, Dr. Dwyer,

also remarked that it had no appearance of myxomatous tissue.

June 29: Vision in each eye was 20/70+ with correction, and the stellate infiltrate in the corneal epithelium, as is shown in the cut, was unchanged. The exophthalmos had slightly receded and now measured 26 mm. on each side. There was no lesion of the fundus. He still used a bandage at night.

October 4th: The condition being unchanged, he was sent to the hospital and a large tarsorrhaphy was done on each side after the method advised by Fuchs.

October 22nd: Dionin 1/2 per cent was ordered twice daily.

November 1st: R. V.=20/40+, L. V.=20/20—. The corneas were much clearer.

November 10th: Dionin 1% was given.

December 20th: Dionin 2% was given to use once daily.

June 29, 1916: R. V.=20/30, L. V.=20/20—.

March 16, 1919: Dionin 5% was ordered.

July 18: V.=20/20 each. Dionin was discontinued.

The corneal opacities were gone, but the exophthalmos still measured 26 mm. in each eye. At the present time the vision is unchanged and the exophthalmos is 25 in each eye. His general health is good tho he seems somewhat thinner. Pulse 80.

CASE 2. Mrs. R. C., 44, (History kindly furnished by the Mayo Clinic). Goitre for four years, possibly following last confinement. Some enlargement of throat during past year. Has been nervous and losing weight. In July, 1910, after moving, had nervous prostration with loss of strength, tremor, tachycardia, and palpitation, no dyspnea, no stomach symptoms. Crying spells and nervousness, irritability at start, pulse during spell, 120. Within past two weeks, pulse 90—104. Has felt better in past two or three weeks.

She was admitted to the hospital, November 7, 1910. The eyes protruded markedly, the thyroid was semihard with hard nodules in areas. Bruit. Thrill. Superficial pulsation in veins; marked thyroid pulsation in arteries. November 12—Ligation of left superior thyroid vessels. November 17—Ligation of right superior thyroid vessels. January 3, 1911—Thyroidectomy, extirpation right lobe, isthmus and inner surface left lobe. Pathologic examination showed: Papillary cystic goitre and multiple, small, simple and colloid fetal adenomata, 95 gm. She left Rochester, (date not given) and came to New York in February, finally going to London in March.

In June, 1911, she had an attack of acute proptosis of both eyes and was treated by Mr. Leslie Paton who reports the case in the discussion of Mr. F. A. Juler's paper.[1] When he first saw her, the cornea of the left eye was already sloughing. "In neither eye could the cornea be covered by the lids. The tension in both eyes was +3, and it was practically hopeless to attempt to do anything in the way of sclerotomy under the circumstances."

He did a free tarsorrhaphy in both eyes, uniting the lids after "rawing" the whole extent of the lids from the puncta to the outer canthus. "It was an extremely difficult operation, because, first of all, there was the question whether the patient would be able to stand the general anesthetic at all. Her pulse was 120, mounting up to an uncountable rate. One could feel that there was a running movement in the artery, but the separate impulses could not be counted, and the patient was delirious at the time. * * * * The stitches held for three days, and then broke away. Then Dr. Carruthers removed, under light anesthesia, the very severely affected left eye, which by this time had perforated."

The other eye he sewed up again under anesthesia and put in deep anchor stitches. Both times the orbital tissue was freely incised, the only way to keep the lids together being to split the canthus and incise the orbital tissue. This time the stitches held for four days. Mr. Paton was sent for again three weeks after the first operation. "The orbit from which the eye

had been removed was looking fairly well but was still much swollen. In the second eye, the cornea was grey, the upper lid was at least 3 mm. above the corneal margin, and while she was conscious, tho not reasonable, it could not be pulled down at all. A resection of the cervical sympathetic was considered, but was not done on account of the cicatricial tissue from the thyroid operation which would have interfered. A further attempt was made to sew the lids together; but in a few days the stitches burst again, and the eye had to be removed. Immediately the second eye was removed, the patient's general condition improved. She had been practically delirious for three weeks."

I have recently heard from her, and she is at the present time apparently in good health.

Case 3. P. Q., 44, Male. Admitted to the Manhattan Eye, Ear and Throat Hospital, December 21, 1922. Patient of Dr. H. R. Skeel.

Five days before admission, patient was doing some painting, and while doing this he noticed that his eyes began to smart. His eyes were red the next day but he went to work in the machine shop. He continued at work, and on the third day his vision became a little blurred, more marked in the left eye. He went to work again on the fourth day, and when he left work his eyes were paining him considerably. He consulted his family physician that evening, who gave him some drops to use in his eyes. His doctor saw him on the following day and sent him to the hospital. When he came to the hospital, his vision had failed a great deal and he was having considerable pain in the eyes.

Past History: Patient had usual diseases of childhood. No history of typhoid, pneumonia, scarlet fever, or rheumatism. Had influenza about eight years ago.

General health was good until about 12 years ago. He contracted syphilis at the age of 20. Since that time he has been treated for it by different physicians.

Six or seven years ago, members of the patient's family noticed that his eyes were becoming more prominent than usual, and that he was getting some enlargement of his neck in the region of the thyroid. Within the next year or two, these symptoms had become much more pronounced and he became very nervous. Five years ago he had the thyroid vessels (superior) ligated at the Post-Graduate Hospital. He left the hospital soon after the ligation and soon began to feel much better, became stronger and less nervous. His family doctor did not advise him to have the goitre operated on again, so he never returned to the hospital. He does not think that his eyes have become more prominent than before the ligation until the present attack, when they seemed to protrude rapidly in a few days.

Head and Neck: Patient never had headaches. No trouble with eyes until present illness. He has had all of his upper teeth extracted, but has some bad ones below now. Has always taken cold very easily.

Cardiac and Respiratory: In past few years he has had some trouble with rapid heart, which was much worse following excitement or exertion. No history of chronic cough, or hemoptysis.

Gastrointestional: Appetite good and bowels regular. He has had a right inguinal hernia for the past twenty-five years, for which he has always worn a truss.

Patient is very nervous and excitable, poorly nourished with a loss of muscle tone. Perspires easily. He has a few small palpable cervical glands. Marked induration with enlargement of lateral lobes of thyroid. Heart not enlarged. No murmurs heard. Occasional extra systole. Pulse rate 100 per min. and irregular. Blood pressure 150/90.

Condition of Eyes: Marked exophthalmos of both eyes. Both eyes show a very marked subconjunctival and circumcorneal congestion. Large deep ulcers of lower half of each cornea extending almost to the limbus; with a large slough present on each. Remainder of cornea somewhat hazy. Irides muddy and sluggish. Patient complaining of considerable pain.

Vision, both eyes, large objects.

Laboratory Reports: December 12, 1922: Smears from both eyes show "few pus cells and an occasional Gram positive extracellular diplococcus." Blood Wassermann, 4 plus.

December 27, '22: Urinalysis—Sp. gr. 1028; Albumin moderately heavy trace; sugar, acetone, and diacetic acid, negative. Indican, marked excess.

December 26, '22: Ulcers have progressed steadily and now involve the entire corneas of both eyes. Large sloughs present on each ulcer. Marked chemosis of bulbar conjunctiva of both eyes, which is protruding thru palpebral fissure, and cannot be reduced. Does not complain of pain.

January 5, 1923: Greater part of both corneas sloughing. Some clear cornea above in each eye, where it is covered by upper lid. Has not been able to close his eyes for past ten days. Chemosis more marked in right. Lids of left closed with adhesive and bandage applied.

January 9, 1923: Cornea of left eye perforated and large amount of vitreous extruded from the globe. Vitreous was trimmed off and bandage applied. Slight chemosis and secretion. Right eye shows little change. V. O. D.= Shadows.

January 16, 1923: Very little change. Chemosis in right very marked; lids will not cover cornea. Chemosis in left has subsided to great extent.

External canthotomy, right eye, to relieve blepharospasm. Chemosis still very marked. Some clear cornea above. Center of cornea still shows sluggish ulceration with beginning staphyloma.

January 30, 1923: Chemotic conjunctiva right eye incised in a number of places, in attempt to reduce chemosis. Staphyloma of cornea more marked.

February 9, 1923: General condition of patient markedly improved. Right cornea shows central perforation. Chemosis less marked.

February 13, 1923: Right eye, lens presenting in corneal perforation. Chemosis very marked and unable to close lids.

February 17, 1923: Under local anesthesia the right eye was enucleated today. General condition of patient good.

February 27, 1923: General condition of patient improving. Right socket clean. Slight secretion from left.

May 2, 1923: Some chemosis of left conjunctiva (solid type of edema). This does not allow the lid to close toward the inner canthus. The left eyeball is phthisical and very soft. Socket, right, is clean but very much filled up with edematous tissue. Patient's general health has improved a great deal since he came to the hospital. He is less nervous; pulse more regular, rate 88-90, and he has gained weight. No change in appearance of goitre. Vision O.S.=Shadows.

Treatment. Frequent cleansing of eyes, and application of antiseptic ointments. Atropin was used but without results. Both cold and hot moist applications to eyes were made use of at different times. All attempts to keep lids over cornea were futile, and no treatment employed had any effect on the conjunctival chemosis. Patient was given mercury and iodides on account of his positive Wassermann. Under rest and digitalis his heart slowed down and became more regular.

COMMENT.

These cases, especially the first, in which histologic examination was made, seem to point to orbital edema as a cause of the exophthalmos. The cases are presented as instances of a sudden edema which refused to subside. It is well known that in the ordinary type of gradual protrusion of the eyeball, if the disease can be controlled early the exophthalmos may subside, while if the disease runs a protracted course and the exophthalmos becomes very marked it usually remains permanent. This is entirely harmonious with the tissue examination in Case 1, which revealed edematous connective tissue, and also with the behavior of the edema, which for a while could be compressed but which finally became firm and hyperplastic.

The two principal theories of the cause of the exophthalmos are, first, congestion of the blood vessels and

second, contraction of Mueller's muscle.

Claiborne[2] says, "The cause is generally recognized as an excessive amount of blood in the vessels behind the ball lying in the orbit, particularly the veins, and an increase in the amount of fat. To this may be added reasonably some degree of hyperplasia of all the structures in the orbit as the result of long continued congestion."

In the discussion, A. E. Bulson[3] dissented from these statements and considered that postmortem examinations do not bear out the theory of congestion. He also remarked that there was no evidence of congestion of the veins in direct communication with the orbit. He would expect to find pulsation, if the vascular theory was correct. He further says: "The sympathetic is an active and potent factor in the production of exophthalmos. That the exophthalmos is due to mechanical irritation of the sympathetic nerves by the hyperplastic goitre is open to question. The sympathetic disturbances are, in the majority of cases, secondary and not primary." With these latter statements I am in the main in accord. Why an orbital edema does not extend more frequently to the lids, as it apparently did in my case, is of course an unknown point. It is also a mystery why it occurs at all.

Plummer,[4] regards exophthalmos as a most important differential point in the diagnosis of toxic hyperplastic and toxic nonhyperplastic goitres. It is his belief that an alteration in the construction of the thyroxin nucleus determines the production of the exophthalmos. Kessel, Hyman, and Lande,[5] state that the striking role of the age of the patient, as demonstrated in their series of fifty cases, indicates that it is a change occurring in the end organs rather than an alteration in the thyroid structure or secretion that determines the presence of the exophthalmos. The degree of this symptom does not parallel the severity or duration of the disease. It is dependent on the end tissues of the patient, rather than on the specific elaboration of any toxic product. Complete restitution to the normal rarely, if ever, occurs. Exophthalmos, thyroid enlargement, lability of the pulse rate, and the sympathomimetic symptoms, do not entirely and permanently disappear.

W. R. Parker,[6] reports an interesting case of luxation of the eyeballs, in which both eyes were lost. In the discussion, H. M. Langdon says, "It hardly appeals to one that accumulation of orbital fat will explain all things; we do not have an accumulation of fat elsewhere in a hyperthyroid case, we have exactly the opposite. Why the selective action of the condition for fat of the orbit? It seems more likely to be of a vascular origin with probable formation of fibrous tissue in the orbit from the vascularity, which would account for the exophthalmos persisting when all the general signs have disappeared."

In my case the tissue, where I was able to observe it, in the conjunctiva, organized without a marked increase in the vascularity. It was for the most part pale and flabby, and gradually grew harder and denser until it could no longer be compressed.

Carl Fisher, in the same discussion, queries if the stretching of the recti muscles cannot be a cause, but if this were true the eyeball could be pushed back, which is not the case. The eyeball in backward displacement comes against firm tissue with very little "give" to it. Fisher does not believe in the contraction of Mueller's muscle and says the contraction "cannot produce more than a slight exophthalmos." It may also be questioned why a muscular contraction should give such a series of clinical symptoms as has been detailed. This theory of contraction of Mueller's muscle seems to me fantastical in the extreme.

W. Falta,[7] says that in longstanding cases the ocular protrusion becomes permanent and under these conditions is due to an increased deposit of retrobulbar fat tissue. R. Foster Moore,[8] in a similar case to those reported, made an incision thru the conjunctiva "thru the whole length of the inferior fornix." He then removed as much orbital fat as possible so as to relieve the tension. He remarked that the fat "seemed edematous and in particular the inferior, internal, and external recti muscles were explored for a considerable distance, and these instead of being thin, flat, ribbon like mus-

cles, such as one becomes familiar with in squint operations, were greatly swollen fusiform bellies apparently from edematous infiltration, not quite so stout as the last joint of one's little finger."

It is quite possible that in this latter case the edema pushed forward the fat so as to make it seem greater in quantity. Moore explored the orbit with his finger but could not feel anything but "soft fat."

Passing to the consideration of the clinical side of the condition, it is apparent that marked exophthalmos is accompanied by grave danger to the integrity of the eyeball, and it is probable that sudden protrusion is more dangerous than slow protrusion. I have not succeeded however, in finding much that is definite with regard to cases of sudden protrusion, altho Falta (loc. cit.) says that "in some cases, an alarming change may supervene in a few days or over night." It is of course possible that in the reported cases the distinction of a sudden edema is not made.

T. R. Pooley,[9] reports the case of a man of 57, in whom exophthalmos had existed for six months. In three weeks, the condition increased so rapidly as to cause the conjunctiva to protrude thru the palpebral fissure. One eye was lost thru corneal ulceration, while the other was saved with vision of 20/30.

Marcus Gunn,[10] reports a similar case which three months later still showed injection and edema of the conjunctiva. R. V.=6/12, L. V.=6/6.

There are numerous cases of loss of both eyes thru gradual protrusion and corneal ulceration. H. Sattler,[11] goes over the literature and summarizes numerous reports of slight affections, but says their connection with the disease must be accepted with great caution. He collects the published cases of corneal involvement. He refers to forty cases in which both eyes were lost.

F. A. Juler,[12] reported a case in which one eye was lost from purulent keratitis. The other eye was saved thru resection of the cervical sympathetic and tarsorrhaphy. Several cases of loss of both eyes were reported in the discussion. W. H. Jessop,[13] collected notes on twenty-two published cases and reported three more. Fourteen cases had lost both eyes. He advises against tarsorrhaphy until the tension has somewhat subsided.

In Case 1, of my report, there was a definite period of tension of the lids when division of the external canthus was of great assistance. Later the lid tension grew less and protective measures were not so difficult. It seems that the removal of the orbital fat, as practiced by Foster Moore, is a good surgical procedure and one relatively free from risk.

Concerning the reason for this sudden onset of edema in these cases, I have no opinion to offer. Two of the cases now reported occurred after extensive thyroidal operations. In the third case nothing more than ligation of the thyroid vessels was done. In a very limited observation of the medicinal treatment of this disease, I am of the opinion that for the relief of this class of eye complications we must at present rely on surgical measures rather than medical ones, and they must be carried out with great celerity if the vision is to be saved. These measures are—tarsorrhaphy, removal of orbital fat, division of the external canthus, removal of edematous conjunctiva, and such measures designed to relieve the tension on the lids and protect the cornea. Removal of the cervical sympathetic has been performed a number of times with some apparent benefit, but seems to have fallen into disuse in later years.

One cannot fail to be impressed with the lack of intraocular complications in this disease. My own personal experience has shown only a mild degree of engorgement of the retinal vessels such as one would expect from the mechanical pressure.

However a few cases are reported which should be mentioned.

H. Sattler,[14] reports a case of retrobulbar neuritis which he considered an early symptom of exophthalmic goitre. The patient was a man of 57, with vision of 2/3, with a small central scotoma for red and green. Neurologic examination negative, Wassermann negative, nothing found by X-ray examination.

He smoked three or four cigars daily and was instructed to stop entirely. He was given potassium iodid. Four months

later vision was 1/10. The sphenoid was opened without result. Six months later protrusion of both eyes was noticed, measuring 22 mm. Pulse rate 100. Other symptoms of goitre appeared. Exophthalmos increased gradually to 28 mm. Altho thyroid was not greatly enlarged, vision went down to 1/16 and 1/20 and the optic nerves began to look pale. "Unilateral strumectomy" was done and a month later, the exophthalmos had diminished to 26 mm. and vision had improved to 1/3 and 1/6. He finally improved to 22 mm. exophthalmos and vision 1/2 and 1/6. Pulse 72. Sattler has collected eight cases in a recent literature, and remarks that a few other cases occur in older writings where the neuritis could not be referred to other causes.

E. von Hippel,[15] cites four cases reported by him in 1915 which had hyperplasia of the thyroid in the presence of optic neuritis. C. Behr,[16] writes on optic neuritis in endocrin disturbances and emphasizes the possible origin of retrobulbar or intraocular optic neuritis thru endogenic toxicoses. Terrien,[17] says that in parathyroid disturbances, changes of refraction have been noted as well as optic neuritis and edema of the iris epithelium. Functional disturbances of the suprarenals, in the form of increased activity, may occasionally manifest themselves in the eye thru a tendency to attacks of glaucoma.

With regard to tension changes, Csapody,[18] says that operations reducing the function of the thyroid may cause an increase of ocular tension. In younger or recurrent goitres a change of tension may occur in either direction. His material comprises 27 goitre cases. He considers that the thyroid gland plays an important part in the regulation of the ocular pressure. E. von Hippel,[19] writing on the Abderhalden dialysis procedure, says that disintegration of the thymus is usually found in exophthalmic goitre. Twenty cases are cited. In eleven cases of optic neuritis, iridocyclitis, iritis, and scleritis, thyroid enlargement was noted four times. Two cases of optic neuritis apparently due to thyroid diturbance are reported in detail. H. Barkan,[20] reports a case of glaucoma due to orbital edema, and says that by the rarity of such cases the presumption is that it is an unusual etiologic factor.

It may not be amiss to call attention to the contrast in the clinical history of orbital edema in other cases in which goitre has been excluded.

K. Albrecht,[21] reports a case of optic neuritis in a girl of 18 years, associated with attacks of edema of the eyelids and other parts of the face. She finally recovered under systematic arsenical treatment.

Meyer-Hurlimann,[22] cites a case of Quincke's edema in the left eye of a woman 51 years of age. Both eyelids were enormously swollen and slightly reddened, and the eyeball was enormously protruded and "totally immovable." The onset was acute, and at the end of five days it had entirely subsided. She had several similar attacks without the least damage to vision. Six such cases are quoted from the literature.

A. F. MacCallan,[23] reports a case of gradual edema of the orbit with exophthalmos, in which a decompression was done with temporary relief. Autopsy later showed that the condition originated "probably in an attack of cerebrospinal fever some years previously, which had cleared up, and left a thickened pia-arachnoid which interfered with the return flow of lymph from the orbit. The condition in fact seemed to be one of lymphatic edema of the orbital tissues with most pronounced bilateral exophthalmos."

E. Morelli,[24] reports a case of edema and exophthalmos in a girl of thirteen. It occurred at regular intervals of about a month, prior to the onset of the first menstruation, and was accompanied by vicarious hemorrhages from the nose, lungs, and conjunctiva. The condition lasted each time from five to ten days and subsided as menstruation became established.

C. Meyer,[25] reports an interesting case of intermittent exophthalmos in a woman of 37. When a child of five the attacks had begun and had lasted up to the twelfth year. The attacks lasted several hours and were accompanied by pain in the eye and orbit. The vision in one eye had suddenly become obliterated during

an attack, but the other eye was normal.

Gruss,[26] reports a case of acute edema of the retrobulbar tissue in a man of about thirty. The exophthalmos lasted about twenty-four hours and was repeated in two weeks. The vision was not injured. The author believed the attack to be a vasomotor affection.

M. Teillais,[27] reports the case of a woman of 35 who had had five attacks in the course of two years.

These cases of simple edema subside, as a rule, without damage to vision.

CONCLUSION. Finally it is probable, taking into consideration such evidence as we have at present, which it is admitted is not altogether conclusive, that the exophthalmos in exophthalmic goitre is due to a localized edema in the posterior part of the orbit, which, for some unknown reason, if sufficiently prolonged, is followed by connective tissues proliferation and permanent thickening of the orbital tissues.

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HEREDITARY CATARACT.

ALBERT L. BROWN, M.D.

CINCINNATI, OHIO.

The cases occurring in three generations of one family are here reported. Of eight descendants of the first patient, seven were affected. Transmission was always from the mother, but affected both sons and daughters.

The series of cataractous families scattered thruout the literature present interesting features of heredity, pathology and, in a measure, a phase of sociology which cannot be disregarded.

At intervals, various theories of etiology of transmission have been promulgated, among those being that the condition was the effect of consanguineous marriages, e.g., the marriage of first cousins, the hypersensibility of an individual with cataractous predisposition with the consequent transmission of such tendency to offspring. As a rule, the transmission of definite hereditary cataracts have been by females to children, both sexes equally; and then from the females of those children to both sexes of their offspring, ad infinitum.

It is noteworthy that other ocular manifestations, such as coloboma, albinism, aniridia, anophthalmus, microphthalmus, atrophy of optic nerve, familial degeneration of the cornea, glaucoma, megalophthalmus, nystagmus, ophthalmoplegia externa and strabismus, retinitis pigmentosa and also refractive errors are often transmitted on a similar schedule. In general this is the usual way, but exceptions are by no means rare.

The family herein reported has been observed for a period of twelve years. The family was first interviewed and carefully examined and individuals of the family operated upon by Dr. Louis Sticker of Cincinnati, to whom I am indebted for the careful notes taken in 1911.

Nov. 1, 1911. The family consists of the father and mother and four children. One child died of scarlet fever (eyes perfect). Of the living children, one R., 4 years, has perfect vision. No ocular defects. The mother and three children all have exactly the same condition (congenital nuclear cataract), and the condition is more pronounced in each successive birth. The general family history is:

Mrs. M.T., mother—33 yrs. Husband—living and well. Occupation—truck driver. So far as known his eyes are perfect. The family moved to Cincinnati from Kentucky seven years ago. The mother's parents were not related. Father—Irish. Mother—German. Her eyes have been affected since birth. She has never received any education. Nystagmus both eyes.

Left eye. There is a snow white cataract, which fills the pupillary space. Vision is nil. No light sense. Cataract is centrally located and has shape of a rosette. This in turn is surrounded by a less dense, but still very cloudy zonular cataract, which seems to take in the entire cortex of the lens. Ophthalmoscope, no red reflex seen.

Right eye. V. 6/60. Iris tremulous. On focal illumination, a defect in the lens with cataract formation can be discerned. The fundus is normal.

SECOND GENERATION.

M.T., Daughter—10 yrs. Mother states that her eyes were affected at birth. Had spasms when 2 wks. old.

Left eye. V. 6/60. Nystagmus and convergent squint. Focal illumination—A snow white cataract can be plainly seen occupying the anatomic center of the lens, surrounded entirely by transparent lens tissue which fills the pupillary space. Ophthalmoscopically, this central cataract appears as two globules, bluish white in color, sitting on a white background from which radiate many fine spicules out into the cortical substance. Between these a red reflex of the fundus can be seen.

Right eye. Cannot discern any print, distance or near. Ophthalmoscopically, a white central mass is easily seen, somewhat shrunken. This is enclosed in what appears like bluish bands which radiate from the cataract in all directions toward the equator.

Nov. 14, 1911. Double iridectomy under chloroform, downward and inward in both eyes.

Nov. 20, 1911. Recovery complete. Sent home.

Nov. 21, 1911.

O.S. +1.00 cyl. ax. 60°. V. 6/60.

O.D. +1.00 cyl. ax. 60°. V. 6/60.

Has never been able to see objects at any distance (length of arm). Now recognizes people and objects a block away, and states that she sees much more clearly.

E.T., Son—7 Yrs. Nov. 1, 1911. Never has attended school because of eyes.

Left eye. V. 6/60. Sees no print. Conditions are practically the same as in case of sister (above). Focal illumination—A central nuclear cataract practically the size of the pupil, with the form of a rosette. Brown pigment at edges and small dark brown spot in center.

Right eye. V. 1/60. No print. Exactly same formation.

Nov. 14, 1911. Double iridectomy under chloroform, both eyes down and in. Obtained a splendid pupil in both eyes. No incarceration; pillars of iris free. Further history exactly as that of sister. Complete recovery and improvement.

L.T., Daughter. 2 yrs. Nov. 1, 1911. Conditions exactly same as those of brother and sister, only the cataracts are more pronounced, larger, more intensely white, and show as yet no signs of contraction due to age so that they are more sharply outlined and regular. No evidence of rosette formation, but globular exactly in the center of the lens. Child has nystagmus and concomitant squint. No tests for vision could be made.

Nov. 14, 1911. Double iridectomy done. Left eye, coloboma does not extend to sclerocorneal margin. Rt. eye, iridectomy perfect.

M.T., Son. 6 weeks. Born since the other members of the family came under observation. Examined under homatropin and found to have exactly the same condition as the other members of the family. Conditions in both eyes exactly the same. In the center of the nucleus of the lens is a snow white area, with a few riders extending outward. Both anterior and posterior to this area transparent lens substance exists, this being, as in the case of the other members of the family, a congenital, central, nuclear cataract. Feb. 9, '17. Double iridectomy, down and in.

The family came to my attention February, 1923, when the youngest child of the original cataractous mother was brought to the Pedriatric Department of the Cincinnati General Hospital. There have been more additions in the last 12 years to the second generation, and now there is a third generation. The daughter, M.T., is now 22 years of age, was married 4 1/2 years ago to a normal man, and has two sons, both of whom have the same type cataracts.

After the four children, as reported above, the fifth, a girl, now 10 years old, has congenital nuclear cataracts which have never been treated, because the mother has not thought it necessary to bring her under observation. The sixth, a girl, 5 years, also has the same type cataracts. The lens of each eye presents a bluish-gray opacity almost filling the pupillary space. Around the periphery a slight red reflex is obtained. There is a slow oscillation of both eyes when the child is disturbed.

THIRD GENERATION.

M.R., boy, 3 yrs. Central, white, nuclear cataracts filling the entire pupillary spaces. No reflex can be seen. There is apparently no light perception. No movement when light is flashed into eyes.

A.R., boy, 18 mos. Type exactly as in M.R., with the same findings. No reflex is obtained in either eye.

A general chart to illustrate the distribution of the cataracts was prepared, using squares to denote males, circles, females, and connecting lines, marriages. In every case, the transmission may be seen as being from a female. The husbands of the cataractous females were normal, and there were no blood relationships between any of them. In these respects the family is very similar to the one reported by Danforth[1]. The report extended thru three generations, none of the individuals marrying the cataractous members were related, and all the transmission of the affection was traceable to the females of each generation.

GENERAL REMARKS.

The questions which arise in the discussion of hereditary cataract, as in the case of any hereditary condition, are not only of theoretic but of practical interest. The question is one of sociologic importance as well as scientific. In general, the phases that are presented are (1) Exact nature of the defect, whether developmental or metabolic. (2) Origin, when it suddenly appears in an apparently healthy and normal strain of individuals. (3) Mode of transmission. (4) Variability within a group. (5) Relations to other peculiarities that affected individuals may show. (6) Sociologic aspect.

The question of the developmental or metabolic origin is difficult to determine. In so far as the pathologic manifestations are concerned, Verhoeff[2], in his report on coralliform cataracts, feels that lamellar forms are developmental and coralliform cataracts are metabolic, including those with the greater percentage of inorganic material. Embryologically, there are probably various ways developmental cataracts may be started.

For example, a chick embryo was being examined in section, and the amnion was found to be drawn into the lens cavity and held. If that situation continued, a resulting cataract might be regarded as due to imperfectly developed or retarded amnion. Other early observations on chick embryos with special reference to ocular embryology, dealt with irregular separation of the lens vesicle from the surface ectoderm, which condition, if it continues, might be considered to form a cataract[3].

In amphibiae, the lens forms when the ectoderm is stimulated by the optic cup from the primitive brain vesicle, from which the retina ultimately develops. If the optic cup is removed, no lens develops; but if planted elsewhere, the lens may be made to develop in anomalous positions.[4]

In dealing with transmission, from the suggested origin above, interesting speculation arises. Might an error in the developmental processes during gestation place its mark upon the germ plasm to such a degree, that 58% of the progeny, especially from the female side, would be so affected? If metabolic, practically the same question might be asked.

With the process in full sway, there appears variations within the group, both as to type of cataract and even presence or absence. Within groups of almost all reported cases, there are individuals who are entirely free of any such ocular condition. There are also associated peculiarities and defects, especially mental ones, which might be expected considering the absence of so important a faculty as sight. Then too, the partners in marriage of affected individuals are usually of low mental caliber, so that the general inheritance of the offspring is anything but desirable.

This brings up the sociologic question of marriage among such individuals. Loeb[5] has made a comprehensive summary of hereditary ocular diseases and causes of hereditary blindness. Questionnaires were sent to a great number of ophthalmologists and superintendents of homes for the blind, asking their views as to the advisability of limiting marriages among those having hereditary ocular conditions. While some differentiated between those having nontransmissible and transmissible diseases, the majority seemed to favor limitation. A resumé of the reported cases[5] shows an interesting distribution.

No. of families	286
Father affected	145
Mother affected	152
Unknown	7
No. of children affected	589
No. of children unaffected	428
Total No. of children	1012
Percentage of affection	58%

This phase cannot be pursued at length here, but it would certainly seem justifiable in the light of 12 years observation of the case herein reported; where each successive generation simply afforded more inmates to some home for the blind.

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LIPEMIA RETINALIS, EFFECTS OF INSULIN.

WILLIAM F. HARDY, M.D.

ST. LOUIS, MO.

The introduction of insulin gives a method of getting the patient free from sugar excess, in preparation for operation. A case treated with insulin is here reported, with details of its influence on body sugar. Read before the American Ophthalmological Society at Colorado Springs, June, 1923.

Lipemia retinalis, appears to be less rare than the older literature indicates, due doubtless to a closer scrutiny, at the present time, of the eyegrounds of diabetics, and the keen interest of the internist in seeking the cooperation of the ophthalmologist. The raison d'etre of the present report is provided by the advent of insulin in the field of therapeutics.

It is desirable to secure a sugar free state in a patient requiring an intraocular operation. Since the recent introduction of insulin this condition can usually be brought about, rapidly and readily. To this extent then, it has a direct bearing on ophthalmology. In a recent article by Root and Gray[1] two additional cases of lipemia retinalis are described, bringing the total number of recorded cases up to 27. The case report credited to Benedict by these authors is a mistake, as Dr. Benedict in a discussion of McGuire's paper[2] only mentioned having observed the cases later reported by Wagener.[3]

In 1921 I had the honor of addressing this Society on the subject of Lipemia Retinalis and reported a case with full metabolic findings.[4] Subsequent reports have been made by McGuire, Wagener (3 cases) and by Root and Gray (2 cases).

The patient described in my previous report died, a few months following my paper, after a short period of unrestrained carbohydrate indulgence. No further opportunity had been afforded for the study of his general or ocular condition. In February of this year (1923), a second patient with lipemia retinalis was entered at the Barnes Hospital. As the use of insulin has been introduced since the prevous case was observed, the report of the effect of the new treatment of Banting is not without interest.

CASE. The history is as folows:—E.J. D., white, male, age 23 years, was admitted Feb. 13, 1923, in a state of coma. I saw the patient within two hours, the pupils having been dilated with homatropin in the interim. As soon as admitted, blood and urine were taken for examination. The centrifuged blood showed the tube apparently half filled with fat, indicating a marked lipemia. The urine examination revealed considerable sugar and acetone. The arms, legs and scalp were covered with lesions of xanthoma diabeticum, blood pressure 130/70, breath strong of acetone. The CO_2 vol. %, less than 10; the lowest previous count with the patient surviving having been 16. The patient appeared to be in extremis, and the ocular examination was interrupted to allow the last rites of the Church to be administered.

The media were clear—some retinal edema was present as evidenced by the absence of clear cut borders to the disc and vessels. The disc and vessels appeared the same color, no differentiation being made between arteries and veins, and the light streak was absent. The vessels looked as if filled with malted milk. As in the previous case reported, there was no suggestion of a salmon pink color. The idea has been suggested that the appearance of the retinal vessels may depend on the size of the fat droplets and the state of their emulsification. No infiltrates or hemorrhages were noted.

Thirty-three units of insulin had been given soon after entering the hospital. The next day (Feb. 14th) the retinal edema had disappeared and the disc and vessels were well defined. The characteristic appearance of lipemia retinalis, however continued. Insulin was given daily, and the interne noticed a return of the fundus to normal appearance on the 16th, which was confirmed by me on the 17th.

At the possible risk of tiring you, I shall enumerate a few facts in connection with diabetes, acidosis and lipemia, which, tho they indirectly affect our specialty, are seldom touched upon in ophthalmology. Diabetic acidosis is due either to overproduction, or deficient utilization, of diacetic and beta-oxybutyric acids. The essential cause of acidosis is not known, as a definite relationship between it and internal pancreatic secretion has not been established. In fact it is not known whether the acetone bodies are normal intermediate products or pathologic products. The acetone bodies producing acidosis represent imperfect combustion of fat; and their formation is not from carbohydrates as might be surmised, but on the contrary may be lessened or utilized by the ingestion of carbohydrates.

A rather close relationship exists between acidosis and carbon dioxid output, hence the latter when reduced below certain limits is an indication of the former. According to Allen, the lowering of the carbon dioxid carrying power of the blood indicates a late severe stage of acidosis. Every case of diabetic acidosis is not accompanied by lipemia, but it may be said that virtually all cases of marked lipema show an acidosis.

Fat normally is taken up by the tissues as fast as it is absorbed into the blood. The lipemia of diabetes represents an accumulation of food fat, resulting from the tissues failing to take up and dispose of it in the usual normal manner.

During fasting the clear blood plasma contains about 0.7 per cent of total lipoids; and at the height of digestion the lipemia is between one and two per cent, mostly in the dissolved form. It does not seem logical that the doubling or even trebling of the lipemia of digestion can cause the visibility of an emulsion like plasma in the retinal vessels. Either there must be some physical or chemical change in the fat droplets to bring this

TABLE 1.

	Blood Sugar	CO_2 Vol. Percent	Blood Fat (Bloor's Method)	Urine		
				Sp. Gr.	Sugar	FeCls.
Feb. 13, 1923..	.305	10 (minus)	4.5 percent	....	....	....
Feb. 14, 1923..	....	17.4	Cholesterol 1.8 percent	1016	14.87 grm.	+ + +
Feb. 15, 1923..	.350	50	....	....	....	....
Feb. 16, 1923..	....	56.6	....	....	....	....
Feb. 17, 1923..	....	....	2.37 percent	1005	12.08 grm.	0
Feb. 18, 1923..	.266	....	....	....	....	....
Feb. 25, 1923.	....	....	2 percent Cholesterol 1.25 percent	1006	3.3 grm.	....
Feb. 26, 1923..	....	....		1007	0	0

Daily examinations and estimates of urine made and recorded but omitted here.
Red blood corpuscles, on entrance 3,550,000; white blood corpuscles, 16,000; Hb, 85 percent.

INSULIN THERAPY. DAILY QUANTITY GIVEN IN TWO DOSES.

Feb. 13, 1923, 33 units on entrance. Characteristic fundus picture.
Feb. 14, 1923, 110 units. Characteristic fundus picture.
Feb. 15, 1923, 70 units.
Feb. 16, 1923, 80 units. Fundi of normal appearance (interne's note).
Feb. 17, 1923, 67 units. Fundi of normal appearance confirmed by writer.
Feb. 18, 1923, 80 units.
Feb. 25, 1923, 60 units.
Mar. 11, 1923, Discontinued temporarily.

about, or else the lower fat estimates in lipemia retinalis have been erroneous.

In the present case I was slow to accept the laboratory estimate. The apparently very high fat content in the centrifugal tube specimen did not harmonize with the laboratory findings, the latter being 4.5 per cent. My previous impression that the fundus picture did not appear until the lipemia was considerably in excess of 5 per cent, must therefore be revised if the lower laboratory figures are correct, and the true threshold placed between 3 and 4 per cent.

Lipemia in itself is not always of grave significance, but that combination of circumstances or phenomena which eventuate in the picture of lipemia retinalis seem to mark the case as one of bad prognosis.

The substance isolated from the islands of Langerhans has been termed *insulin;* its presence is absolutely necessary for the maintenance of metabolic equilibrium. Diabetes is accompanied by degenerative changes in the island of Langerhans with a diminution, or cessation of their important internal secretion. The question of metabolism and more so of pathologic metabolic states is so complex and involved, that it is useless to speculate on how insulin acts in a beneficent manner, since relatively little is known concerning it. Whatever may be the modus operandi in the production of lipemia, the clinical fact is very evident that insulin effects a rapid reduction in the blood fat; and likewise a proper oxidation of fat and sugar, with a disappearance of suboxidation products from the blood and urine.

The rapidity with which the fundus picture returns to normal by the administration of insulin is a most striking feature. The effect of the preparation in the case under discussion can be described by no less a word than miraculous. The apparently dying patient was veritably snatched from the grave.

Owing to the fact that insulin is rendered inert when given by the mouth, it must at present be given hypodermatically or intravenously. The dosage is flexible and suited to the individual case; 40 to 60 units may be considered an average daily dose.

It may be found possible to prolong the lives of these patients for a considerable period by the use of insulin; without such therapy it can be said with a degree of assurance, that death in coma is to be expected in a relatively short time.

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NOTES, CASES, INSTRUMENTS

CASE OF LATE INFECTION AFTER TREPHINING.

R. H. Elliot, M.D.

LONDON, ENGLAND.

I have frequently been asked by American surgeons whether I have ever met with a case of late infection in my own practice, and have promised them that if I were at any time to do so, they should know of it at once. I have just recently seen the first case, and think that the notes may prove of interest, more especially, as they illustrate the very condition under which this complication may with most reason be feared to occur.

Miss J.S., aged 68, first seen by me on 14.8.18., had been trephined by a capable surgeon four years previously for glaucoma in both eyes above the corneae. Tension returned in R. E. in May, 1918. She consulted various surgeons who all recommended operation. The trephine opening was closing in the R. E. This appeared to have followed an injury in 1917. L. E. filtration perfect. R. E. vision 6/24, with +2. sphere 6/6 partly. L. E. vision 6/24, pupil blocked by pigment and exudate, evidently due to want of mydriasis after the operation. She was kept under observation for two months, and the pressure rose to 35 mm. Hg., as calculated by the Schiötz instrument.

The following are the details of the operation as taken from the notes made immediately after the procedure. The italics have since been added to draw attention to certain points:

19.10.18. Trephined R. E., an operation of *extreme difficulty*. The upper segment of conjunctiva proved too adherent to undermine. The outer quadrant was tried, and the conjunctiva tore in spite of great care. The lower flap was next raised. *It was thin and brittle, and had to be handled with extreme care;* 1/2 mm. of cornea split; 2mm. disc, cut first on corneal side, and most of disc removed.

Sutured up flap *with extreme care and difficulty;* two stitches used.

Eye still not filtering well, but soft. Atropin instilled.

Hemorrhage troublesome.

The patient made a good recovery, and when seen a year later vision had improved to 6/18 partly. The lenses of both eyes showed opacities.

Again, one year, later she was still progressing favorably with good filtration in both eyes. That was the last time I had seen her up to the present.

On 22.4.22. Colonel Kirkpatrick saw her during my absence in America, and has kindly permitted me to use his original notes:

22.4.22. On 11th had been in bed with a cold for two days; in night nose bleed, pain in R. E. and severe vomiting; a good deal of discharge. Dr. —— used eserin. Seemed better on next (Wednesday) morning, but sight greatly diminished. Eyelids were much swollen, had quantity of discharge.

Present state. Very slight swelling of lid. Marked conjunctival and ciliary injection; steamy over lower half of cornea—rather sharply limited by a horizontal line above. The trephine area is prominent and infiltrated; margin of flap sharply demarcated; chamber medium, no k.p.; pupil contracted but not blocked; iris, crypts obscured and tissue swollen; surface covered by small petechial hemorrhages. Tension (McLean) 10 mm. Hyoscin. Mag. Sulph. irrigation. Ung. Hydrarg. Pil. Hydrarg. Aspirin grs. 10 t.i.d.

Prognosis: May get back some sight. Has high blood pressure.

24.4.22. The iris is ever so much clearer and the infection has decreased most markedly, but there is a cloud in the lens and one cannot get illumination. Hyoscin put in at consultation. Atropin drops and dionin t.i.d. added to medicines used at noon. Zinc ointment to lid.

26.4.22. Improvement continued; carry on; vision = hand movements.

28.4.22. Marked improvement; T. low, post. synechia; infection much less; eyebath four times daily; stop aspirin. Use Ung. Hydrarg. ć Zinc Oxid; Atropin with dionin. Discharged to

care of own doctor at home. No illumination V.=H.M. L. V. 3/36. My own note now follows:

2.10.23. R. E. vision = hand movements; the media are quite opaque, and no fundus reflex can be obtained; the tension is normal; there is little if any evidence of past uveitis; the loss of sight appears to be largely due to the advance of the cataractous condition, and an extraction might greatly improve vision. But the patient's age (73) and general condition, combined with the fact that she has useful sight in the other eye, makes me hesitate to advocate further operative interference, which can always be kept in reserve in case anything goes wrong with the better eye.

The interesting features in this case are:

A. (1) That the late infection occurred in an eye which had been twice trephined.
(2) That the second trephining had been made below, and
(3) That the conjunctiva was extremely thin and brittle, with very little subconjunctival tissue beneath it. (See the original notes of the operation.)

B. (1) That as a result of the first operation she kept sight in both eyes for eight years.
(2) That in one eye she still has useful sight nine years after the first operation.
(3) That the loss of sight in the eye which suffered late infection would appear to be in some part due to the advance of the cataract in that eye, the progress of which appeared to have been hastened by the complication.

I would like, once again, to emphasize what I have so long held and so consistently maintained—viz. that the onset of a late infection is favored by a thin covering of the filtering scar, and that, given a proper technic, it is a complication which should comparatively seldom be encountered, the danger being most real in cases such as the above, where the conjunctiva and subconjunctival tissue are very thin.

UNUSUAL DEVELOPMENT OF TISSUES OF THE IRIS.

JULIUS FEJÉR, M.D.
BUDAPEST, HUNGARY.

In the following lines I wish to give a description of a strange and rare change of the tissues of the iris, the like of which I had not met with before during a long practice. But before turning to the pathologic and clinical comments on my case, let me give the following diagnosis and objective description.

The patient was a woman, 45 years of age, who had suffered an inflammation of the iris in both of her eyes, seventeen years ago; the etiology of which might be sought for in her lymphatic, scrofulus constitution. The inflammation was entirely cured. No trouble remained other than a narrow posterior synechia in her right eye, up and out. I observed this case for many years and found the eyes sound and healthy. Since two years, however, I find a change in her left eye; which, altho without irritation, increases slowly but surely.

In the left eye, near the limbus, outward, above in the periphery of the anterior chamber, almost surrounding the iris, arising from the tissues, a brownish, projecting formation with lace like edges can be seen. This lies closely against the posterior surface of the cornea, filling out, almost entirely, the chamber angle and lending the parts near the limbus a brownish color. The same can be seen above and inward, but not in such a pronounced manner. This wreath like texture overproduct almost surrounds the pupil, only coming to an end below in the middle and showing there a discontinuance. The shape of the pupil is round and regular; it reacts well in every way. The lens and the vitreous are transparent, the fundus of the eye is healthy. The tension is normal. The vision of both eyes is 5/10. Manifest hyperopia, +0.50 D. improves V. to 5/7, and according to her presbyopia, she reads with +1. D. glasses the smallest letters of the read-

ing book. Central color vision and field of vision are normal.

If we look at it with Zeiss Czapski's binocular microscope with slit lamp illumination, we can see better the pigmented bunches and heaps starting from the trabeculae. But we cannot observe much more, I am sorry to state, even with this extraordinary testing method; for we are unable to look into the nook extent on account of the overgrown iris texture lying quite closely against the posterior surface of the cornea, causing a clouding of the endothelium of the cornea which casts a shadow upon the central part of the iris.

On examining the right eye by means of a magnifying lens, with the light falling from the side, we met with the same phenomenon, tho in a lesser degree; namely, the texture of the right iris is denser, almost velvety and here and there we perceive pointed protuberances starting from the trabeculae, the pigment of which is decidely more abundant.

First of all we have to think of melanoma, the overgrowth of the tissue pointing to this, as well as the abundant pigmentation. According to the rule, the pigmented tumors of any of the tissues of the eyeball are malignant; further they grow rapidly, causing trouble in the circulation of blood very soon, and do not spread in the above described manner, but usually form a solitary tumor. From the point of view of differential diagnosis, a malignant tumor can here be safely excluded. We might think of warts of the iris, such as have been described and sketched by Treacher Collins, Coats, Fleischer and Kraupa; only that in our cases no wart like, hemispheric pointed heaps are found in the ciliary part of the iris. Some of the authors connect the iris warts with the remnant of the pupillary membrane. We can state, therefore, that the objective appearance shows no resemblance either to the melanoma or to melanosis iridis.

Our hypothesis is: That in this case we are dealing with a trabecular overgrowth of the delicate, sponge like tissues which unite the vascular system of the iris. This has been caused probably by the previous iritis, tho the process became visible only many years after. I cannot even give a name to this process, unless I accept the main symptom, viz., the overgrowth of the connective tissue, as a foundation for my diagnosis. We cannot, of course, give a positive opinion on the pathologic cause of the symptoms except by histologic examination. To obtain a part of the tissues of the iris, an iridectomy would be necessary; but as the disease does not show any progress since my first observation almost three years ago, and it does not endanger the sound state and vision of the eye, an operation like this is not indicated.

I tried to have this case illustrated by drawings or photographs, but the differences of depth and level could not be reproduced satisfactorily.

ADJUVANTS TO MAGNET POINTS FOR EXTRACTION OF FOREIGN BODIES FROM ANTERIOR CHAMBER AND IRIS.

BURTON CHANCE, M.D.

PHILADELPHIA, PA.

Sometimes small chips lodging on the iris, or in the angle of the anterior chamber, are most difficult to withdraw; either because their positions necessitate surgical traumatism, or because of the difficulty of approximating the magnet point to the spicule. Two cases have recently occurred in my practice which I was able to manage without further damage to the eye.

The first was one in which a small jagged piece of steel was firmly caught in a furrow of the iris, at the angle in the lower chord of the chamber. The eye showed great reaction to the presence of the spicule, but the iris was not lacerated and the lens was not cloudy.

The wound of entrance in the lower outer quadrant of the cornea had healed completely when the patient applied for treatment.

On approximating the giant magnet, the body was dislodged and would follow at the bidding of the current, yet it could not be forced to penetrate the cornea. I incised the cornea at the upper limbus, intending to seize the body with iris forceps, but the serrations became engaged in the crypts and the body would not be disengaged. I did not wish to iridectomize. An approximation of the magnet, but without the intention of producing such an effect at that moment, dislodged the body and attracted it again to the lower angle. No small points of the magnet were suitable to insert into the corneal opening. I, therefore, cautiously inserted an iris spatula passing it down in the plane of the iris until the point reached the body. To the tip of the handle of this spatula the Parker magnet with a blunt point was applied. The piece of steel immediately responded to the influence, and, as the instrument was withdrawn in a line of motion such as to avoid the pole of the lens and the iris, it was withdrawn without the slightest traumatism. The edges of this chip of metal were unusually spiculate and serrated. The eye promptly recovered and full visual acuteness was attained.

The second case presented a spicule lodged in the iris tissue, in the upper nasal quadrant, and could not be dislodged by the magnetic current. I incised the cornea at the limbus of the quadrant, and as it was impossible to apply the magnet at such close quarters with the bridge of the nose, I inserted a closed curved beaked iris forceps until the points touched the foreign body. The forceps were held firmly so as to resist the force of the current and the magnet was applied to the joint of the forceps. While the current was on, the forceps were withdrawn in a curved line of motion and the body safely extracted. This eye, too, recovered promptly without any damage whatsoever resulting.

SOCIETY PROCEEDINGS

Reports for this department should be sent at the earliest date practicable to Dr. Harry S. Gradle, 22 E. Washington St., Chicago, Illinois. These reports should present briefly scientific papers and discussions, include date of the meeting and should be signed by the Reporter or Secretary. Complete papers should not be included in such reports; but should be promptly sent to the Editor, as read before the Society.

SAN FRANCISCO COUNTY MEDICAL SOCIETY.

Eye, Ear, Nose, and Throat Section.

September 25, 1923.

EDWARD F. GLASER, Chairman.

Visual Defects in Drivers of Automobiles, and Proper Legislation.

DR. WALTER SCOTT FRANKLIN presented a paper in an effort to open discussion on this subject. He hoped that it might be the starting point toward proper legislation. He felt that the proper supervision of the eyesight of people driving automobiles was essential for the public safety. He cited several cases coming under his observation.

Dr. A., age 50, had a myopia of 16 diopters in the right eye with 13 in the left. His correction gave him R.E.V. 0.3; L.E.V. 0.6. He drove his car, an open car, daily. His glasses were nose glasses which might easily have been blown off by the wind, and left him to drive his car with vision of fingers at a few feet.

Mr. R., age 45, had R.E.V. 0.3, L.E. prothesis. Examination of the right eye showed chronic simple glaucoma with constricted tubular field in his only eye. He drove his car daily. He was a real menace to every driver, yet bragged about his ability to drive even tho his vision was so poor.

Mrs. Z., age 57, had R.E.V. with correction 0.3, L.E.V. with correction 0.4. The examination of her eyes showed bilateral incipient cataracts. She came complaining of difficulty in driving at night due to the glare of approaching machines.

Mr. G., age 39, had a bilateral healed trachoma pannus, with a marked refractive error that, upon correction, gave him R.E.V. 0.5; L.E.V. 0.6. He had been wearing nose glasses and was driving a truck.

These cases are but a few types of the many seen by every oculist. They show clearly the necessity for visual examination in the operators of motor cars, particularly professional drivers. The requirements for locomotive engineers are very exacting and yet in the operation of a machine, which is more difficult, no supervision is made of the physical qualifications of the driver.

Discussion. MR. W. J. FRENCH, of the Industrial Accident Commission, said that the records of the California Industrial Accident Commission show that there were 9,328 permanent injuries reported during the five years, 1917 to 1921, inclusive, and that, out of the total, 1,223 were permanent eye injuries. For the same five years the statistics disclose 393,622 temporary injuries, and included in this large total were 41,162 temporary eye injuries. More regrettable than anything else is the fact that there were 18 cases of total blindness reported during the five years, all charged to accidents sustained by employees.

It is impossible to find in the State records many cases of marked visual defects in drivers of automobiles, because of the difficulty of keeping classifications so refined in character, and also because eye injuries are usually sustained by men with good or fair eyesight. A search revealed seven reported cases of interest to this discussion. In four instances the men sustaining injuries to their eyes returned to their usual duties as chauffeurs and auto truck drivers. In two instances the records do not show whether the employees returned to work. In the remaining instance the right eye was injured, and the man was unable to resume his employment, because he had previously sustained an injury to the left eye.

R. E. Simpson, engineer of the Travelers Insurance Company, in an address delivered on May 18, 1923, before

the American Society of Safety Engineers in New York, estimated that between 25,000,000 and 30,000,000 workers in this country have subnormal vision. If these figures are nearly correct, the addition of other groups in the community and their proportions of defective eyesight would show a heavy majority of our citizens deficient in this important respect.

Poor vision and bad lighting are responsible for a too large percentage of accidents. There is no doubt of the wisdom of reasonable physical examinations, added to a need to require of automobile drivers some knowledge of the cars they operate before permanent licenses are issued.

Proper legislation to control the problem of marked visual defects in automobile drivers can only come as the result of careful planning. A charge of violating the Sherman anti-trust act might be directed against eye specialists, if laws were speedily adopted requiring the examination of the eyes of all operators of motor vehicles! A conference of the representatives of different interested organizations could well be undertaken, so that the months before the meeting of the California Legislature in 1925 may be utilized in preparing proposed legislation that will, if enacted into law, mean fewer accidents and a reduction in the deaths and injuries sustained each year by our citizens.

It might be well to have the police reports of automobile accidents show whether those concerned give evidence of enucleation, scars, defects or other drawbacks ascertainable by laymen. The California Industrial Accident Commission will be glad to aid the purpose of this meeting.

Mr. George E. Sandford, General Attorney, California State Automobile Association, said that the problem of reducing the great number of accidents resulting from the operation of motor vehicles is increasing and becoming more difficult as time progresses. It is true that mere lack of knowledge and carelessness can account for a great per cent of collisions, but the presence of operators upon the highways who are suffering from mental or physical infirmities is also answerable for a great portion of them.

The only way this percentage can be minimized is by appropriate legislation. By this is meant sound and practical legislation, which will accomplish results without working an unreasonable hardship and inconvenience upon the public. There can be little doubt of the beneficial outcome of legislation which would, by a practical method, make it possible to segregate those who have such physical defects as glaucoma or tubular vision and extreme myopia, or near sightedness, from the mass of drivers.

In California the new Motor Vehicle Act was handed down to the people with no requirement along this line. The law makes it discretionary for the suspension or revocation by the Division of Motor Vehicles, of an operator's or chauffeur's license for reasons of incompetency to drive resulting from physical or mental infirmities. But this discretion is exercisable after complaints have been filed with the Division against any one person. It is then often too late—damage has been suffered.

After a limited perspective into the laws of other states, we find a general expression of opinion from proper state authorities favoring legislation requiring a reasonable examination or method to be followed, for the purpose of determining whether a person is mentally and physically fit to operate a motor vehicle upon the highways before he is granted that privilege. I also am informed that upwards of ten states now have such requirements upon their statute books. The State of Vermont requires that applicants have a thoro examination for physical defects, such as loss of an arm, foot or poor eyesight. Great improvement has been found in the operating of automobiles since the law became effective two years ago. Rhode Island and several other states are at present considering the same matter.

Dr. K. Pischel stated that, in his opinion, it is very timely to bring up this question before the Society, that every effort should be made to secure legislation for the physical examina-

tion of automobile drivers. Such legislation must be liberal and reasonable. While any one who wears glasses has a certain handicap, in fog or rain, for example, this handicap can be overcome by care. A person hard of hearing, or even a deaf person, may be a much safer driver than a reckless fellow, with perfect sight and hearing, but without judgment and feeling of responsibility. A person with one eye only, while greatly handicapped, may overcome this handicap by greater care; but there are limitations. The requirements for a professional taxi or truck driver should be higher, because he can not always drive leisurely and take his time.

Dr. P. Obarrio pointed out that even in a rigid examination, it is possible to overlook an important factor. An officer in the air service who had passed the rigid army tests and had been chosen for great hazards in the service had hemeralopia or night blindness, and had difficulty driving his machine at night. He also felt that bifocals were a definite handicap in driving.

Dr. E. Butler, City Emergency Surgeon, said that while the vision is of great importance, the general driving ability, particularly the power to act in an emergency is of greater significance. He also learned, from Capt. Gleason of the Traffic Squad, that among the various classes the drivers of Ford delivery trucks had the least accidents, while doctors ranked among those that had the greatest number of accidents.

Dr. Franklin, in closing, stated that a reasonable and practical examination is of the utmost importance. With this type of examination the most dangerous drivers would be eliminated.

Frederick C. Cordes,
Secretary.

COLORADO OPHTHALMOLOGICAL SOCIETY.

May 19, 1923.

Dr. F. E. Wallace presiding.

Vitreous Exudate Suggesting Tumor.

G. H. Hopkins, Pueblo, presented a woman who had come on Jan. 3, 1923, on account of failing vision in the left eye, associated with headache over the eye. Vision was right 20/170, left light perception, that of the left eye not being improved by any lens. The right fundus was normal. There was a stellate opacity of the posterior lens capsule, and the fundus reflex was grayish from every direction except above, where a red reflex was obtained. The vitreous was partially filled with a floating gray mass apparently fixed near the center of the globe. No fundus details were visible. At the first examination it had not been possible to transilluminate the lower portion of the fundus. On May 18 the fundus reflex was better, and transillumination was successful everywhere except a spot in the lower part of the eye. Wassermannn, urine, general physical examination, and nose and throat examination were negative. The teeth had been extracted previously. Was the mass in the vitreous, retinal exudate or tumor?

Discussion. Edward Jackson, Denver. When I first looked at the eye with the ophthalmoscope, the condition seemed to be detachment of the retina, perhaps upon a solid foundation, with irregular surface. Subsequently I transilluminated in all directions, altho not very well from the lower nasal quadrant. By transmitted light there seemed to be masses in the vitreous that had more or less motion. The history did not apparently point toward tumor, but was more like that of focal infection followed by uveal inflammation.

C. E. Walker, Denver, thought sinus infection rather likely, and the initial condition in the eye probably choroiditis.

Penetrating Injury.

G. H. Hopkins, Pueblo, presented a boy, aged three years, who had come on September 30, 1922, on account of a large penetrating wound to the nasal side, and extending across the center of the cornea of the right eye. The iris had remained attached to the upper part of the cornea, so that the upper portion of the anterior chamber was practically obliterated. The pupil was one mm. in diameter, and did not re-

spond to light. The eye was, nevertheless, entirely quiet. The vision of the injured eye was light perception. Was there any danger to the left eye?

Discussion. C. E. WALKER, Denver. I do not think the eye should come out. Cases in which the iris is engaged in the wound are likely to be lost from secondary glaucoma. The thing to do as early as possible is to detach the adherent iris.

Retinal Hemorrhage in Nephritis.

J. J. PATTEE, Pueblo, presented a man, aged twenty-six years, who had come on account of sudden and complete failure of the vision of the right eye. The vision of this eye had been somewhat impaired for about eight months. The vision of the left eye was approximately normal. The fundus reflex of the right eye was abolished by a large hemorrhage. The left retinal veins were full and slightly tortuous. Wassermann blood test was negative. Urinalysis showed a specific gravity of 1010, and two per cent of albumin.

Melanotic Tumor of Eyelid.

J. J. PATTEE, Pueblo, presented a man, aged forty years, who had come in October, 1921, on acount of a small tumor at the junction of the middle and outer thirds of the right lower eyelid. The growth had first been noticed three months previously, after a slight change in the color of the lid at this point. At the time of the patient's first visit, there was a brownish mass as large as a very small grain of wheat, with a very dark center and slightly elevated. It was surrounded by an area of brownish discoloration about a quarter of an inch across. When the patient returned on May 1, 1923, the growth occupied more than one-third of the length of the lower lid, reaching to within four mm. of the outer canthus. It extended from the lid margin downward over the skin to the lower border of the tarsal plate, and covered the conjunctiva over a corresponding area. It was almost black, with a suggestion of the color of port wine, slightly elevated, of smooth contour, and intensely hard.

Discussion. C. E. WALKER, Denver. Is it advisable, before excising such a tumor as this, to use radium or the X-ray to limit the possibility of scattering active tumor cells in the surrounding tissues?

W. F. MATSON, Denver, spoke of a roentgenologist having recommended the use of the X-ray before operation to block the lymphatic channels in the surrounding tissues.

W. T. BRINTON, Denver. The growth has rather the appearance of a pigmented nevus than of an angioma. The conjunctiva of the lid is a pigment bearing membrane. A pigmented nevus would be more likely than an angioma to change into a melanotic sarcoma.

W. C. FINNOFF, Denver. There is a good deal of discussion as to the classification of these tumors. The pigmented moles are probably epithelial in origin, and if so do not come under the classification of sarcoma. The use of radium before removing the growth is a common practice with some French operators.

W. H. CRISP, Denver, remarked that the growth was so firm, solid, and black as to make the diagnosis of angioma improbable.

O. S. KRETSCHMER, Pueblo (by invitation). Speaking from the point of view of a pathologist, we may have to disregard the question of consistency of the tumor. The mode of onset rather suggests nevus. Final diagnosis would depend upon microscopic study. I do not think the present condition is alarming, the progress of the growth having been so slow and there being no sign of disintegration. But a tumor of this kind may at any time flare up.

E. M. MARBOURG, Colorado Springs. Some years ago I presented a case of melanosarcoma at the sclerocorneal margin. Growth was extremely slow. The late Dr. Rivers enucleated the eye, and within six months the man died from metastasis.

J. J. PATTEE, Pueblo, would rather see clean surgical excision done in such a case, than anything else he knew of.

Neuroretinitis.

F. E. WALLACE, Pueblo, presented a woman, aged forty-eight years, who, for many years, had had a great deal

of poor health, and whose vision had been failing gradually for the past three years. The corrected vision had varied from R. 20/70, L. 20/25 to R. 20/40, L. 20/20 mostly. Urinalysis showed a high specific gravity, and a trace of albumin. The fundus changes included tortuosity of the veins, great tortuosity of the terminal vessels, bright pin point spots at the end of the small vessels, limited areas of mottling, and indistinctness of the disc margin.

Keratitis, Probably Tuberculous.

F. E. WALLACE, Pueblo, presented two sisters aged nine and seven years, who, altho apparently in good general health, had, for several years, been subject to attacks of ocular inflammation. Both sisters were on several occasions affected within a short time of one another, altho it had not been possible to disclose any definite factor in diet or other home circumstances which might explain this coincidence. The mother gave a history of having in early life had several attacks of an apparently similar condition. In each child there were several cloudy spots in either cornea. After removal of both pairs of tonsils in July, 1921, the attacks had not recurred until January, 1923, when both girls had attacks which seemed more severe than any of the preceding ones. The Wassermann test had proved negative in each case. Tuberculin injections had been administered since February, 1923. The dosage of old tuberculin reached had been ten mgs. The most recent injection, of 5 mgs., had produced no reaction.

Discussion. O. S. KRETSCHMER, Pueblo, (by invitation) read a detailed report of the administration of tuberculin, the dose varying from .0001 mg. to 10 mg. in the course of two months.

W. C. FINNOFF, Denver. I have seen several cases of this type. These phlyctenules really belong to the socalled scrofulous group, which is probably related to tuberculosis. Ponndorf has advanced an interesting theory to the effect that the "scrofulous" changes in the eye and in the lymphatic glands, are a reaction to the tuberculin produced in the patient's system; the sensitivity varying from time to time. He believes that tuberculin injected subcutaneously aggravates these conditions. One of our clinic patients had a focal reaction every time we gave her tuberculin. To desensitize these patients to tuberculin, Ponndorf scarifies the arm over an area of about one inch square, and covers the scarified area with old tuberculin. In positive cases there is a large local reaction lasting from two or three days to a week. In a case I am following now, there have been recurring phlyctenules and scrofulous keratitis. I have used the second Ponndorf in this case, and the eyes have cleared up remarkably. Other patients we have had in the clinic have had focal reactions from the Ponndorf, and in them tuberculin is contraindicated.

J. M. SHIELDS, Denver, mentioned a woman of fifty-four years in whom typical phlyctenules at the limbus had responded promptly to dusting with calomel.

C. E. WALKER, Denver. These cases of phlyctenules commonly get well without tuberculin, which in many cases is dangerous.

W. F. MATSON, Denver, suggested that rest of the eyes was a very important factor in the treatment of phlyctenules.

EDWARD JACKSON, Denver. Atropin is properly used in these cases, and care as to diet is very important, especially as to the omission of sweets.

Vernal Catarrh.

F. E. WALLACE, Pueblo, presented two cases of vernal catarrh, one in a girl aged twelve years, the other in a man aged thirty years. In the child the left upper lid was slightly swollen and the episcleral vessels engorged. On everting the upper lid small hemorrhages occurred from the mucous membrane. There was a conjunctival ridge at the temporal limbus, measuring three by eight mm. Six days later a second ridge developed to the temporal side from the original one. In the man there was a two or three mm. thickening of the bulbar conjunctiva near the limbus.

WM. H. CRISP,
Secretary.

BALTIMORE CITY MEDICAL SOCIETY.

Ophthalmological Section.

October 25, 1923.

DR. DOWNEY, presiding.

Dr. Herbert Harlan.

THE CHAIRMAN stated, that as the late Dr. Herbert Harlan had been such an active member of the society and one whom the members desired to honor, he had requested Dr. Hiram Woods to devote the first part of the meeting to remarks upon Dr. Harlan's life and work as he knew him.

DR. WOODS then gave some personal reminiscences of Dr. Harlan, who was born in 1856, the son of Dr. David Harlan. He graduated in medicine from the University of Maryland in 1879, at which institution the speaker became acquainted with him in 1881, while he was demonstrator in anatomy. He later occupied the position of Professor of Diseases of the Eye and Ear in the Baltimore University in 1890, holding the same position at the Women's Medical College in 1896. He became surgeon at the Presbyterian Eye, Ear, Nose and Throat Charity Hospital in 1890.

He was always a most indefatigable worker, a most painstaking teacher, an efficient administrator, and always stood for a square deal. His work as member and chairman of the State Board of Medical Examiners, and as a member of the National Examining Board, was of the utmost value to the state and to the nation. He had held for many years that simplifying the medical courses was to be desired rather than elaborating them.

His end came suddenly after a day's work, while seeking recreation upon the golf field.

Observations in Foreign Eye Clinics.

DR. HARRY FRIEDENWALD said: The first clinic visited was Moorfields, where we found a vast clinic with thoroly equipped operators. It was of interest to note that most of the cataract extractions were done without iridectomy.

We next attended the Ophthalmological Congress at Oxford, where a very stimulating program was heard. A paper on "The Significance of Scotomata," by Traquair, was of especial moment. Another paper on the "Relation of Dental Infection to Eye Lesions" was also discussed with interest.

In Paris most of the time was spent with Magitot, who showed us his method of colored photography of external lesions of the eye. He has over 3,000 of these colored photographs, and all clinical instruction is done by means of these pictures instead of demonstrations upon the patient. He also demonstrated a new tonometer, which works with a spring and can be used horizontally as well as vertically, with a direct reading dial. The instrument known as the dynamometre oculaire, by Bailliart, whereby the arterial and venous pressures are ascertained, was also demonstrated. In Freiburg we found a beautiful hospital with excellent laboratories. At Heidelberg the clinics were full of tubercular eye lesions, which were attributed in a large measure to malnutrition.

In Munich the hospital was practically closed on account of the recent death of Prof. C. Hess.

In Vienna Professor Dimmer showed his method of photography of the fundus oculi, and seemed exceedingly grateful for the assistance rendered by the Rockefeller Institute, which made possible his present photographic outfit. A very pleasant evening was spent with Prof. Fuchs in his country home. He was still enthusiastic over his trip thru the United States and remembered in detail many incidents in the places visited.

A visit to Berlin was rather disappointing. Little scientific work was found in progress. All the laboratories and clinics were hampered by lack of funds, and there was even difficulty in getting animals for the Wassermann reactions. The cost of publishing is so great as to be almost prohibitive, and the financial gain from medicine is so little that many medical men are seeking other positions, and there are practically no students tak-

ing up the work. Dr. Friedenwald thought that unless America takes up the scientific investigations which the Germans are being forced to relinquish, much scientific work will be lost.

A visit to Copenhagen revealed excellent work with fine laboratories, especial stress being laid upon the physiology of vision.

In Holland, at Utrecht, at the hospital that Donders made famous, much work was being done upon the physiology of accommodation. In conclusion he wished to say that the visitors were received and treated with the greatest consideration in all places.

C. A. CLAPP, Secretary.

THE ROYAL SOCIETY OF MEDICINE (LONDON).

Section of Ophthalmology.

November 9, 1923.

MR. A. L. WHITEHEAD (of Leeds) presiding.

Pseudoretinitis Pigmentosa.

MR. JOSEPH exhibited a patient, aged 63. She had some of the signs of retinitis pigmentosa, but none of the symptoms. There was characteristic pigment distribution, and in places there were choroidal changes. The fields showed an annular scotoma. There was no night blindness; she could walk along a country lane in the evening to her home, a mile distant, without trouble. With correction, the visual acuity in each eye was 6/9. There was no associated history in the family.

MR. MONTAGUE HINE showed a somewhat similar case. He brought the man from the Pensions Department, because it seemed to be a case of monocular retinitis pigmentosa. Other members had seen him, and considered it resembled retinitis pigmentosa. The left fundus had always been passed as normal. The field in the left eye was full, but that in the right was contracted to the 5° circle. Vision was 6/36 and 6/60. The man had an injury over his frontal sinus in 1918, and he himself attributed the failure of vision to that injury. The question arose as to whether it could be an inflammatory condition.

Discussion. MR. ERNEST CLARKE thought the term "retinitis pigmentosa" ought to be got rid of, substituting the term used abroad: "pigmentary atrophic retinitis."

MR. GRAY CLEGG said he had seen similar cases of retinitis pigmentosa in one eye. He had thought the condition might have followed either a blow on the eye, or a concussion disturbance.

MR. WILLIAMSON mentioned a case which was under Mr. Leslie Paton, of pigmentary degeneration in one eye; the picture was quite typical of the condition, and in the fellow eye the vision was normal.

THE PRESIDENT said, irregular migration of pigment was a common occurrence after direct injury to the eye; also in "windage" cases during the war, when shells exploded near to the patient without any direct material injury by fragments. But he had never seen an appearance corresponding to that in Mr. Hine's case. In the war cases the discs underwent ordinary atrophic changes.

MR. R. AFFLECK GREEVES suggested that a condition of this kind might be produced by an injury which affected the posterior ciliary arteries, so that their blood supply was interfered with.

MR. WHITING said, Mr. Hine's case differed from those which showed concussion changes in the retina. In France he never saw any concussion changes which were in the least like those presented by this patient. He was not aware of any cases having occurred as a proved result of "windage." The present case he regarded as indistinguishable from retinitis pigmentosa.

Tuberculous Conjunctivitis.

MR. DOYNE showed a case of tuberculous conjunctivitis. The child came with a suppurating preauricular gland, and it was opened. It was now in the ward. A maternal grandmother and aunt died of tuberculosis. When the child first came there was a marked cockscomb appearance in the lower

fornix. So far no treatment except the application of iodoform had been given.

Discussion. MR. ERNEST CLARKE drew attention to the condition of the teeth, and MR. J. B. LAWFORD did not doubt that it was a case of tubercle, advocating an X-ray examination of the intrathoracic glands. A French investigation showed that the deep glands were often involved when superficial glands showed no sign of the disease. In doubtful cases this X-ray examination afforded a useful diagnostic measure.

THE PRESIDENT also felt sure the condition was tuberculous; he reminded members that he dealt with this subject in his presidential address before the Section.

MR. BASIL LANG referred to the views of Calmette, that tubercle was acquired before the fifth year of life, that it remained dormant in thoracic or abdominal glands, and that at some subsequent date, when there was malnutrition, or disease came on, the disease reasserted itself.

Diving Spectacles.

MR. VALENTINE showed and demonstrated a pair of diving spectacles.

Refraction Under Water.

MR. RAYNER BATTEN exhibited the hydrophthalmoscope, which indicated the refraction obtained under water. It consisted of a small cup filled with water and placed on the eye. Vision of an emmetrope gave fingers at one foot. By putting in a +20D. and a +10D. lens, fair vision was secured.

Report on Interstitial Keratitis.

MR. LINDSAY REA submitted to the Section a preliminary communication on this subject. In view of the divergent views in the profession on the subject, he decided to speak only of those cases he, himself, had observed and followed up. His investigation embraced 91 cases, seen at three hospitals. In 1863 Jonathan Hutchinson called these cases "strumous corneitis," and regarded them as syphilitic in origin; and had the courage to give them antisyphilitic treatment, and believed he produced in them a decided improvement. But neither he nor a number of other workers gave the subsequent vision.

Rudolph, of Vienna, however, did this; and was much impressed by the value of novarsenobillon and salvarsan, believing that their use prevented the onset of the condition in the fellow eye. But it should be remembered that the onset in the other eye might be delayed ten years. In Mr. Rea's 91 cases, there were three males to one female. In a large proportion the patients were from 5 to 6 years of age; only two were over 26. He had never yet seen healthy temporary incisor teeth in these children. The associated deafness was labyrinthine. Three authorities looked upon this deafness as hopeless, owing to the thickening of the canal lining, and the oval window being covered over with bone, while the vessels were the seat of obliterative endarteritis.

Any treatment which would even contribute to lessen the trouble was well worth consideration and trial. He quoted a number of cases in which the treatment was definitely beneficial. In many the blood Wassermann was negative, but the cerebrospinal fluid luetic gold curve was positive.

He had found three modes of onset in his cases. In the first, there was a small patch of haze, a macula, discrete to the naked eye; a common type. In the second type there was a "salmon patch"; in the third, the fulminating type, the cornea rapidly became vascularised, and there were many deep and superficial vessels.

The earliest result he had had was to secure 6/6 vision in four months; from 6 to 8 months was the average time for a good result to ensue. After the arsenical compound was stopped, the treatment was continued with mercury. It was important to keep the pupils widely dilated.

Discussion. MR. HUMPHRY NEAME, discussing the contribution, said that in 1921 he reported that in 39 recent cases 30 gave a positive Wassermann. He did not agree that even the majority of cases of old interstitial keratitis

gave a negative Wassermann. In one type there was what looked like a phlyctenule at the limbus. In some, the onset of the condition was marked by the development of a deep folding of Descemet's membrane, probably owing to edema of the substantia propria. He saw the condition develop in one case two or three weeks after the receipt of a blow in the eye, which caused a black eye; also one in which it followed an apparently satisfactory cataract extraction.

Dr. Worster-Drought, speaking from the neurologist's standpoint, said he did not regard interstitial keratitis as necessarily the last manifestation of congenital syphilis; in one instance which he related, two years after the eye condition the patient had a popliteal aneurysm, and later had sluggish pupils, one knee and one ankle jerk were lost, and he had tabes dorsalis of congenital origin. It was not uncommon to find the blood Wassermann of these cases negative, but they were very likely to show the positive luetic gold test. Salvarsan could be given subcutaneously, and the results seemed to be as good as with N. A. B. and other similar preparations.

Mr. Cunningham referred to the great length of time which might supervene between the affection of the two eyes. He agreed that the use of N.A.B. for these cases shortened the duration of the condition.

Mr. Cyril Walker spoke of at least two cases in which injury was thought to be the determining factor.

Mr. Goulden referred to the difficulty of knowing how much benefit was due to the N.A.B. when atropin did so much good to the local condition. In two cases, which he related, thoro courses of N.A.B. and mercury was followed by the development of interstitial keratitis.

The President said that a large number of these cases were seen in the North of England. He had been in the habit of having all his cases treated with galyl, or similar preparations, and he felt satisfied that the results now were better than formerly. Probably a factor in this was the cases coming under observation at an earlier stage. He always supplemented the specific treatment by tonics.

H. Dickinson, Reporter.

SPECIAL REPORT.

MEDICAL RESEARCH IN CONNECTION WITH OPHTHALMOLOGIC HOSPITALS AND CLINICS.

CONRAD BERENS, JR., M.D.

NEW YORK CITY.

The Section on Ophthalmology of the Associated Out-Patient Clinics of New York City was organized in January, 1922, to discuss the many problems presented by out-patient work in ophthalmology and to consider ways and means of promoting higher standards of service. The Section, which is composed of medical representatives of the forty-one member institutions of the Association which operate eye clinics, elected an executive committee of nine members.*

Under the direction of this Committee a careful survey was made of the existing conditions in representative clinics in New York City by the author, assisted by Gertrude E. Sturgis, M.D., Assisting Secretary of the Associated Out-Patient Clinics, and Ray R. Losey, M.D. On the basis of the findings of this study, recommendations for an ideal out-patient service in Ophthalmology were adopted by the Section. (A.J.O. April, 1923, p. 320.)

One of the most unsatisfactory conditions found was the almost entire lack of organization or facilities for research in the large ophthalmologic institutions of New York. No real organization for research was found in any institution. In one clinic interesting cases are cross indexed by disease and available for teaching and study. No use is made of the remaining mass of clinical material in the other institutions for the advancement of knowledge in the prevention or treatment of disease. This paper was prompted by the desire to have the ophthalmologic institutions take some steps to assume their heavy responsibility in this field.

DIFFICULTIES OF RESEARCH.

Almost every physician is interested in some medical problem which he desires to solve, but few ever have time to devote to research; therefore many puzzling questions remain unanswered. What are some of the reasons why the average medical man is unable to find time to devote to scientific investigation? One of the main reasons is that he must make a living, and this takes so much of his energy and fills his day so completely, that he is unable to accomplish anything of value in the few remaining hours. There are so many patients to be treated in our clinics that few of us have time for study, with the result that the unlimited research material is not utilized. Take the case of the house surgeon on the ophthalmologic service; he learns how to operate upon and treat a few ocular conditions, but the chances are that he never has the opportunity of studying one problem in ophthalmology thoroly. He does not learn to consult the literature, or the proper way to bring his work to the attention of others. The chief deterrent to the potential student is that there is no organization to help him with his research problems, and he has neither time nor money to develop the organization for himself. If the average physician wishes to do research today, he must collect all his own cases, spend hours consulting the literature, and do the greater part of the routine work himself, unless he is so situated that he can give up all private and clinic work and devote his time to research in connection with such an organization as the Rockefeller Institute.

NEED FOR RESEARCH WITH EYE CLINICS.

Every one knows how ignorant we are of the causes of some of the most common ocular diseases which should be, and we all hope some day will be, preventable, for example, sympathetic ophthalmia, phlyctenular keratitis, glaucoma and some forms of cataract. With definite knowledge of the causes of these ocular affections, our preventive meas-

*Walter E. Lambert, M.D., Chairman; Edgar S. Thomson, M.D., Vice-Chairman; Conrad Berens, Jr., M.D., Secretary; Executive Committee; Ellice M. Alger, M.D., Isaac Hartshorne, M.D., P. Chalmers Jameson, M.D., H. H. Tyson, M.D., J. M. Wheeler, M.D., Julius Wolff, M.D., and the officers.

ures might be made more specific, which would mean a great step forward in the problem of the prevention of blindness. For example, in trachoma and early optic atrophy, due to syphilis, more specific treatment might save useful sight for many. However, little advance is being made in the method of treating these conditions and practically nothing is being done in connection with the large ophthalmic institutions to advance the cause of preventive ophthalmology.

There is also great need for improving our method and instruments for diagnosis, for early diagnosis and treatment is an important factor in the endeavor to conserve vision.

There is not only need for research but for the publication of results. Letting the other man know what we are doing and knowing what he is studying prevents duplication of effort, stimulates a spirit of cooperation, creates interest in research and encourages the improvement of methods for preventing, diagnosing and treating ocular diseases.

Facilities for research in connection with large eye clinics are most useful, for it is only by working in close relation with patients that we can keep from losing sight of the practical application of our research.

It is my endeavor to outline a tentative plan in the hope of stimulating discussion. My immediate object is founded on my desire to see such an organization established in connection with a large eye service, so that preventive ophthalmology, and particularly that part relating to the prevention of blindness, may be placed on a solid foundation thru scientific investigation; and so that any person qualified to do reasearch in ophthalmology should be encouraged to present a problem and if it seems practical, should be given every assistance in completing his work.

PROPOSED ORGANIZATION AND ITS WORKING.

If this plan were considered in connection with a well organized eye clinic closely associated with a general hospital or general medical clinics, the following personnel and equipment would be required: Personnel—director, pathologist, physiologist, laboratory technician, social service nurse, filing clerk, mechanic and carpenter, operating room nurse, secretary and librarian, stenographer, operating room and laboratory man; Equipment and rooms—operating room equipment, shop equipment, other equipment, dark room for physiologic optics, clinic and small dark room with stalls, room for animals, operating room.

It is evident that most of the personnel and facilities are already available in any well organized clinic, so that this work could at least be commenced with only one additional helper, namely an intelligent secretary who has had medical experience, both clinical and literary, working under the supervision of a volunteer director of research.

In a general out-patient department the organization for research would function for all departments, thus decreasing the overhead chargeable to any special service. More research for less money is therefore possible in a general than in a special institution.

After the literature had been carefully studied with secretarial aid, the problem would be outlined and presented to the director, who would consider it carefully with the pathologist and physiologist. The necessary clinic records would be collected by the filing clerk and the desired patients written to by the stenographer. Any patients who did not respond would be traced and visited by the social service nurse and requested to present themselves for examination. Further examinations would be made in the special clinic with the aid of the physiologist. If new apparatus were required, it would be made by the carpenter and mechanic. Bacteriologic, pathologic, serologic and photographic examinations would be made by the laboratory technician directed by the pathologist. Examinations requiring adaptation would be done in the physiologic laboratory with the aid of the psychologist. Animal experimentation would be done in the operating room with the assistance of the pathologist and the nurse. When the observations were finished the data would be collected by the librarian and the stenographer, who would both aid in writing the paper.

The library of the hospital could be used and a valuable addition to reference sources would be provided if reprints were collected and cross indexed under author and subject.

The existing laboratory facilities could be improved upon and adapted for research work by making a few changes. By instituting a system of cross indexing by diagnosis in the clinics, a great wealth of clinical material would be accessible for study. It is a fact that at one of our largest eye hospitals there are over a million histories, representing valuable data collected by conscientious, painstaking physicians, which is of no scientific value because the records are not cross indexed according to disease. It costs the hospital a large sum to collect these records, and they could be made of value if a few filing clerks were employed and a cross indexing system instituted.

If a research department were added to a large eye institution, it would attract the best ophthalmologists in the city. If there were a school of ophthalmology connected with the hospital, it would draw to itself a class of students capable of doing research and presenting theses, instruction in ophthalmology.

It is naturally understood that these observations with a few modifications are equally applicable, and possibly even more important, to the general hospital.

Conclusions:

1. Valuable research could and would be done by the average physician if a well organized research bureau were available in his clinic or hospital.

2. The initial cost and the maintenance of a research department in any hospital would be small in comparison with the great benefit derived.

3. If more research were done in our hospitals, patients would receive better treatment, for each physician would improve his methods of preventing, diagnosing and treating diseases.

4. If students were permitted to visit the hospitals and out-patient departments to work out problems and prepare theses, graduate teaching would be put on a high plane and every man who had presented a thesis would be better fitted for and would probably continue to do research.

5. If more medical men had the opportunity to do research, the practice of medicine would soon be placed on a more scientific basis and treatment would be more specific.

6. If the need for research and the small cost of maintaining a research department in a large hospital or clinic were explained to the directors, they would insist upon this type of work and procure the necessary funds.

7. In order that duplication of effort in research may be reduced to a minimum, a column in one of the Ophthalmologic journals should be devoted to questions and answers in regard to research problems.

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EDITORIAL STAFF

EDWARD JACKSON, Editor,
217 Imperial Bldg., Denver, Colo.
M. URIBE-TRONCOSO,
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MEYER WIENER,
Carleton Bldg., St. Louis, Mo.
CLARENCE LOEB, Associate Editor,
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CASEY A. WOOD,
7 W. Madison St., Chicago, Ill.
HARRY V. WÜRDEMANN,
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THE DIAGNOSIS OF BLINDNESS.

This was important for war, in the selection of men for the various services, and in detecting those who sought by pretended blindness to shirk their duty. It is important in peace, to make sure that men will not seek employment with defects of sight that unfit them for it, or claim a pension on account of the defect, which they had before entering the service. It is essential to decide questions of damages and compensation, of admission to institutions and benefits for the blind. As these things become more common, and as philanthropic undertakings to lessen the hardships of the blind are more widely established, and offer the lazy and unscrupulous a premium for malingering, the diagnosis of blindness becomes more important.

For practical purposes, partial blindness is far more common than complete blindness. The diagnosis of blindness is largely the estimation of the extent to which vision is impaired. The evidence regarding vision is objective and subjective. The latter is capable of very exact determination, but only with the cooperation, honesty and frankness on the part of the person tested; who is generally interested not in scientific truth or exact justice, but in establishing his claim to good vision or to visual disability. Scientific truth and justice demand that the subjective evidence should be checked by comparing with all the objective findings.

The subjective evidence of maximum vision is easily checked by making the person tested tell what he sees. It is only necessary to make him say the letters he claims to see, or to tell which way the incomplete ring or square is turned, to make the usual subjective tests yield objective evidence. The same is true of having him match colors, or tell which of several colors is exposed, or if the fingers move or are still at the periphery of the field, when testing his field of vision. To prove objectively that a person is not so blind as he claims to be is a more difficult proposition, one that may draw on all the resources of the trained and experienced oculist.

These resources include the observation of discrepancies in the statements of the patient as to what he sees, of protective and involuntary reactions to impressions that can only reach him thru sight, the study of objective evidence of disease in the visual apparatus and the

disagreement between the symptoms or disability complained of and the conditions objectively found. But our methods of examination of the eye, and of the visual function, are now so far developed that from objective evidence alone, it is possible to reach a positive conclusion as to whether or not organic blindness is present. It therefore becomes a duty for each ophthalmologist to perfect his methods for complete and systematic objective examination of the eyes and the visual function; and to gain a practical acquaintance with the ways of unmasking visual malingering, or proving the nature of psychic blindness. With strictly objective methods must be included the objective application of subjective tests like those mentioned for visual acuity, the visual field and color perception.

The involuntary reactions of the eyes to light are: those of the pupil, (direct, consensual and hemianopic) and those reflex movements of the eyeball that are necessary to maintain or restore binocular single vision. If a person having binocular vision looks at, or near, a bright light in a darkened room, a prism of five centrads (5°) thrust before one eye, will cause diplopia. If the base of the prism and the diplopia are horizontal, the eye will turn so as to fuse the image. When the prism is withdrawn, diplopia again occurs and the eye turns quickly back to its original position to escape it. The strength of prism mentioned is about the weakest that will cause a movement of the eye that can be certainly noticed; but it is so weak that few if any persons having binocular vision can prevent the movement. With stronger prisms the movements become more noticeable, but the person examined may be able to prevent such movements by voluntary inhibition.

To decide if the condition claimed or complained of agrees with the objective findings, and the known facts of visual anatomy, physiology and pathology, demands a thoro acquaintance with these facts on the part of the examiner, and a scientific attitude of devotion to the discovery of the actual truth. But with these the ophthalmologist can furnish by far the most reliable evidence of the existence or degree of blindness, that boards, commissions, or courts can obtain for their guidance. All human testimony is fallible, but that of the conscientious well trained oculist with regard to blindness is as little liable to error as any that can be offered, and should be given in definite, positive form with all the force that properly attaches to expert evidence.

E. J.

PSYCHIC BLINDNESS.

It would clear our conceptions of the subject to recognize, as distinct from blindness due to organic lesions, a form which might be called functional or psychic. If one uses a monocular microscope, or an ophthalmoscope, keeping both eyes open, he learns to watch what he sees thru the instrument, and remain entirely unconscious of what is presented to the other eye.

The amblyopia attending squint is often organic, but in a certain proportion of cases it is not. It has been known to develop without any organic lesion in the squinting eye, that previously saw well; and it has returned to normal, when the eye was again brought into use by transferring the squint to the other eye. This is the condition that has been properly called amblyopia ex anopsia.

There is a natural inclination to regard hysteric blindness as simple falsehood or malingering. But there seems every reason to believe that it is as real as hysteric anesthesia, in which the patient may be burnt with a hot iron, or have needles thrust unexpectedly into the anesthetic skin without showing the slightest evidence of sensation. In a case reported by George C. Harlan, a man who had one eye previously injured and supposed it to be blind, came to have it removed when symptoms of irritation arose in the other. Both eyes appeared normal; and the test for hysteric blindness showed the supposed blind eye had normal vision. The demonstration of this and the opinion that it need not be enucleated caused great rejoicing on the part of the patient. A good many cases of psychic blindness appeared among men subjected to excessive strain and terrifying shock in the late war. Most of them were cured by suggestion, some successes

of the kind being exploited by irregular, advertising healers.

The essential deviation from the normal in these cases is a pathologic withdrawal of consciousness from the influence of the visual apparatus—a loss of the power of vision to influence consciousness. The eye continues to function as an optical instrument. There is every reason to believe that the nerve tracts concerned in vision continue to conduct afferent impulses from the retina even to the occipital cortex. The somnambulist quite unconscious of what he is doing walks about avoiding obstacles, but consciousness is dislocated, so that it no longer has the usual relation to the functions of the sense organs.

It may be that psychic blindness is produced by mere exaggeration of direction elsewhere of mental attention. Sensations are best perceived, perhaps are only perceived, as attention is directed to them. Certainly nothing like the full vision of which an eye is capable is developed, unless the possessor of the eye is thinking of what he is looking at, is making an effort, of which he is more or less conscious, to use his visual function for the particular purpose of seeing that particular object, whether it is the form of a letter, or a speck on the distant horizon that may represent a man, a tree, or a ship. It is not merely that the eye must be turned, so that the image of the object shall fall on the fovea; there must be an additional effort of concentration, which is felt as an effort—the effort of "keeping the mind on it".

Blindness of this nature must be recognized as a pathologic condition; and it is well to have it separated from the word hysteric, altho hysteric blindness is essentially of this nature. If the patient is able to produce such blindness by some voluntary dislocation of consciousness, or if he only pretends unconsciousness of what the visual function reveals, he is out of the class of the blind who need treatment of their eyes, or who may be eligible to the public care or benefits intended for the blind. Laws relating to the blind should recognize the existence of this condition by using a term like "organic blindness" to exclude a condition that is purely mental; and the care or treatment of such cases should go to those who deal with other forms of mental alienation, the psychiatrists.

E. J.

OPHTHALMIC RESEARCH.

In this issue of the JOURNAL there was evidences of the changed relations between Europe and America in regard to leadership in science. Scientific research begins, grows important and will become dominant only in a somewhat advanced civilization. In medical science, research is largely dependent on the development of methods and technic in laboratories, and the collection and study of clinical material in highly developed hospitals. That research is being hampered and stopped in Europe is a matter for regret everywhere; but still more it is a challenge to the New World, as it offers a new responsibility.

In America, laboratories, hospitals, free clinics, even groups organized for private practice, have reached such development, that they command and can utilize material and conditions for scientific research; and in no branch of medicine is this more clearly evident than in ophthalmology. In many places we have the material plant and we have the patients. The time has come when these opportunities must be devoted to the higher uses of original research.

The outstanding American institution devoted primarily to research, the Rockefeller Institute, has justified all that has been given to it. It has not ignored questions of especial interest in ophthalmology; but there are other questions not likely to be investigated in any institution, or under conditions, not especially planned to favor ophthalmic research. Physiologic optics is a field quite apart from general medicine and surgery. Ophthalmic pathology is so different in many respects from pathology studied in other parts of the body, that the general pathologist is quite unfitted to pass judgment upon one of the most clearly characterized of malignant tumors occurring in any part of the body. He is turned aside from its recognition by its misnomer "glioma" of the retina.

By the special report in this issue, attention is called to the place ophthalmic research should have in any clinic, hospital or teaching institution, devoted chiefly or partly to ophthalmology. The train of thought might be carried further. An institution devoted primarily to ophthalmic research would be a foundation worthy of all the resources that could be placed at its command: library, laboratories, connections to furnish material for clinical study and experiment, could all be centered about it, with results that would abundantly justify the wisdom and beneficence of its founders.

But what is needed in America more than anything else is a wider appreciation of the importance of keeping alive and active the spirit of research in individual workers and institutions. We should all feel as one enthusiastic ophthalmologist (see below) puts it. "It embarrasses me when I am forced to describe my hospital experience to these men, who think nothing of spending five or six years in various clinics before they go into practice, and even more to those men who stay in clinics all their lives for practically nothing."

Every honest, conscientious investigation of a case is to some extent a bit of original research. The efficiency of every clinic, or hospital, rests to a large extent on devotion to scientific truth on the part of those who work in it. The first qualification of a teacher is his enthusiasm to learn for himself. The article published last month (A.J. O. 1923, v. 6, p. 955) illustrates how many opportunities for research in ophthalmology may be found in America, if we eagerly look for them. Let American ophthalmologists rise to their opportunity and their new duty; and turn in this direction the eyes of those who seek opportunity to serve mankind. E. J.

CORRESPONDENCE.

Study in Europe.

Freiburg in Baden, Germany.

To the Editor:

I am getting ready to come home, after a most interesting half year. I have just been to Vienna, which is full of good material, very well organized for teaching purposes, but where they are so busy giving courses to throngs of Americans thirsting after knowledge, that I was glad to get back to the more peaceful atmosphere of Freiburg, which, for what I wanted, has been ideal. There is not nearly so much material, naturally; but, what there is, is given most careful treatment, and is used to the best advantage of the assistants, and anyone else who happens to be here.

I am now the only foreigner here, and there have been very few others while I have been here. We had expected that the attitude toward foreigners would perhaps not be too cordial, but we were very agreeably disappointed. Professors Axenfeld and von Szily have been very friendly indeed, and have given me their time so freely that I am constantly embarrassed by it. Professor Axenfeld seems to feel the necessity of an international point of view with respect to things scientific, and goes out of his way to demonstrate it by his own example. I brought an English Colonial, Major Wright, back here from Zurich with me, whom Professor Axenfeld said is the first Englishman who visited him since the war; and they did everything for him in the same way they did for me.

In Berlin, Heidelberg, and Göttingen, I found them also very glad to see Americans coming to see them again, and many interesting things to see. In Berlin, Dr. Frese showed me unusual cases with the slit lamp and bitumi, every day; and at the Greeff clinic, the only one then open, they have at least as much material as at either of the Vienna clinics, with only two Americans there, and a few others, Spanish, American and Italian. In Heidelberg, where I was able to stay only one day, Professor Seidel gave up almost his whole morning to showing me his experiments on the exchange of intraocular fluids, and very nicely they went off.

In view of the fact that Magitot's work has been published in our journal, seeming to bear in an entirely different direction, I thought it might be worth while for Professor Siedel to submit a summary of the most important parts of

his work to the JOURNAL, so that we could see both sides of it. I suggested the possibility of this to him, and he seemed quite willing to do it, if you would care to have it. He has raised quite a storm of argument in Germany, as you know, and all the clinics I have visited are either decidely on his side or on Hamburger's side.

At Göttingen I saw some especially interesting operative work done by Professor von Hippel, including some aspirations of the vitreous for optical purposes, according to zur Nedden. In the laboratory there Professor Igersheimer showed me a great deal of the material from his work on experimental lues, especially interstitial keratitis with masses of spirochetes in the clear cornea.

Here, Professor Axenfeld has told me many interesting things about work in various lines which has been done here, and I have had a wonderful review of Pathology and Embryology with Professor von Szily, who has a mass of fine material. Some work which he has just been doing in the production of cataracts, in the offspring of rats with nutrition defects, will soon come out, and I believe it will turn out to be something very important. I have also been able to get in a much needed review of Ocular Neurology, in the Anatomy Department and out of books.

It embarrasses me when I am forced to describe my hospital experience to these men, who think nothing of spending five or six years in various clinics before they go into practice, and even more to those men who stay in clinics all their lives for practically nothing. I will be glad to get back home, however, now, where I believe my father does some little things better than any of them, and where I can get into a regular routine of work again before I lose the habit entirely.

SANFORD R. GIFFORD.

P. S. I was surprised to find only three other Americans at the Vogt slit lamp course in Zurich, which was very well arranged to cram as much work as possible into one short week. I should think one hundred to a hundred and fifty patients from all over Switzerland were present every day; and, by the use of twenty slit lamps and all the trained assistants which the clinic could afford, all of us managed to see a surprising number of these cases. I think we saw everything described in the Atlas and a few other things.

S. R. G.

BOOK NOTICES.

Ophthalmological Society of Egypt, Bulletin of 1923. Paper, 170 pages, 14 illustrations including 9 colored plates. Cairo, 1923.

This volume illustrates the difficulties of differing languages and the possibility of overcoming them. Its cover carries the name in Arabic, French and English. The address of the King of Egypt in opening the Congress, two of the papers it contains and a few remarks in discussion are printed in Arabic, and one paper is in French. But the other twenty-two papers, the lists of members, Rules of the Society, Report of Annual Meeting and names of Officers are all in English. In view of the fact that the great majority of the ninety-six members, and of the twenty authors of papers, are natives of Egypt, this use of English is significant. If an English speaking Congress of Ophthalmology is held, we can expect that the members of this society will contribute an important share to its scientific proceedings.

A hint of the character of work to be expected from these ophthalmologists may be obtained from this notice which is given a page, next after the title page. "Microscopical examination of tumors will be made free of charge for members of the Ophthalmological Society, at the Giza Ophthalmic Laboratory, if the instructions given at the end of the Bulletin are carried out." The instructions for sending pathologic specimens for examination occupy three pages and include: Directions for wrapping and sending, requirements of a clinical description of the case with provisional diagnosis, instructions for preparing the specimens, how to use fixatives and what they should be, and other details. Reports upon specimens so furnished, with a slide demonstrating the specimen, are

sent its donor. This arrangement has been in effect in Egypt for three years. It is only two years since it was offered in this country thru the cooperation of the United States Army Medical Museum and the American Academy of Ophthalmology and Oto-Laryngology.

The subjects of the individual papers will all be listed in Current Literature. The first three refer to diphtheria. The first is on "Membranous Conjunctivitis" by Drs. MacCallan and Rasheed Bey; the second on "An Outbreak of Diphtheritic Conjunctivitis," by Dr. A. M. Girgis; and the third on "Paralysis of Accommodation after Faucial Diphtheria," by Dr. M. Sobhy Bey. These, with the remarks of the ten speakers who took part in the discussion, fill the most valuable twenty-three pages on ocular diphtheria that have been published in the last ten years. Three papers refer to trachoma and its effects Two cases are reported of insidious iritis after cataract extraction, relieved by removal of decayed dental roots. There are brief accounts of six cases exhibited. Microscopic sections were shown from five cases, of which three were of tuberculosis of the conjunctiva and lacrimal gland.

This volume is entirely free from the faults of tedious elaboration, irrelevant detail and pretentious but unprofitable comment, that mark a good deal of the scientific literature of Europe and America. The papers are brief and practical. They average less than five pages of the Bulletin, or less than three pages of this journal. In this respect this book comes close to the standards of the Transactions of the Ophthalmological Society of the United Kingdom. There are a half dozen tables, three of them giving statistics regarding diphtheritic and membranous conjunctivitis. The illustrations, especially those in colors, are rather crude, but each tells something that justifies its use.

We suppose copies of this Bulletin may be obtained thru the Honorable Secretary, Ophthalmological Society of Egypt, care Department of Public Health, Cairo, Egypt.

E. J.

Sajous' Analytic Cyclopedia of Practical Medicine. Charles E. de M. Sajous, M.D., L.L.D. and **Louis T. de M. Sajous,** B.S., M.D. **Supplement.** Cloth, 825 pages, illustrated.

Index to the Seventh Edition and Supplements. Cloth, 481 pages. Philadelphia, F. A. Davis Co.

Among the sixteen different ophthalmic subjects referred to in this book, the topics given most space are: Amaurosis and amblyopia, 2 pages; cataract, 5 pages; and epidemic encephalitis, 5 pages. The material is well selected; but the ophthalmologist will hardly go to this work for information regarding ophthalmic conditions. He will consult it to learn the progress of medicine along other lines. Under Diabetes, he can read up on diet or insulin. The pituitary body gets four pages, the thymus and thyroid about as much; anaphylaxis and allergy occupy six pages. Anesthesia occupies seven pages and has many other mentions under special anesthestics, operations, etc.; but curiously we find no mention of butyn.

The journal, the year book, the cyclopedia with its supplements are all aids to keep abreast of the ever advancing tide of medical science. Some will find more help in one, some in another. He who is most eager to keep fully up with that advance will learn to use all; and probably in time each will find the field in which it can render best service.

The Index Volume applies to the ten volumes of the Seventh Edition of Sajous's Cyclopedia and the supplement above noticed. It is simply an index of subjects; authors cited are not mentioned. The pages are double column, and some idea of the immense number of references may be gained from the fact that those to anesthesia alone occupy more than three columns. An index is a tool difficult to shape, and not easy to use to its full possibilities of usefulness. This one seems to be quite complete.

E. J.

BIOGRAPHIC SKETCHES.

THOMAS H. SHASTID, M.D.

DULUTH, MINN.

EDWARD H. HAZEN. With the passing of Dr. E. H. Hazen, of Oakland, California, the ophthalmologic profession of America has lost one of its oldest, if not indeed, its very oldest, member.

Dr. Hazen was born at Elyria, Ohio,

Edward H. Hazen, 1834-1923.

April 12, 1834. In 1861 he was studying medicine at the University of Michigan, Ann Arbor, Mich. But, in the very midst of his course, he joined the Second Michigan Regiment and served thruout the Civil War. At the close of the War, he attended Western Reserve University, at Cleveland, Ohio, there receiving his medical degree.

For a time he practiced general medicine at Davenport, Iowa, but soon proceeded to New York and London for study of the eye, ear, nose and throat. Returning to Davenport, he opened there an eye and ear infirmary, and was the very first to practice the eye, ear, nose and throat as an exclusive specialty west of Chicago. In those days, atropin had not yet been much employed for cycloplegia, the inch system was used for lenses, and plaster of Paris casts were employed for spectacle frame measurements. In those days, too, all prescriptions for glasses had to be sent to Philadelphia or New York, as there were no manufacturing optical houses in the west. Cocain was still far in the future. Compound lens corrections were often made by using steel frames with double eyewires, and setting in one of the wires a sphere, in the other a cylinder. These steel frames, it is interesting to know, wholesaled at $18.00 per dozen. Dr. Hazen's original equipment, which is very curious, is still in the hands of his family.

Dr. Hazen, later, became widely known thru his bitter opposition to tenotomies. For the exercise of weak, or insufficiently innervated, muscles, he devised an instrument called the kratometer. A later and much improved model of the machine is still manufactured. Dr. Hazen wrote three extensive books on ocular myology, the last one published just before his death.

Dr. Hazen was on the original staff that organized the medical department at the State University of Iowa, in which institution he lectured on the eye for about five years. Later, he removed to Des Moines, where he lectured on the eye and ear for about fifteen years, at Drake University.

In 1910 he retired, and moved to Oakland, California. Here he died, August 3, 1923, in his ninetieth year.

ABSTRACT DEPARTMENT

Reprints and journal articles to be abstracted should be sent to Dr. Lawrence T. Post, 520 Metropolitan Building, St. Louis, Mo. Only important papers will be used in this department, others of interest will be noticed in the Ophthalmic Year Book.

Doyne, P. G. Tournay's Reaction. Brit. J. Ophth., v. VII, No. 9, 1923, p. 420.

Tournay describes the reaction as follows: "When a man whose ocular apparatus is normal, whose pupils are equal, reacting normally to light, contracting normally and equally with movements of convergence and accommodation, looks strongly to his right and maintains this position, the right pupil becomes larger than the left. Thus isocoria being the rule in anterior fixation, anisocoria becomes the rule in lateral fixation."

The author's experience closely confirms Chenet and Noyer's observations. He never with certainty observed contraction of the abducted eye. In extreme abduction the pupil of the abducted eye dilates, but the ease with which this dilatation can be obtained varies within wide limits from case to case.

In the author's series of 40 cases of general paralysis of the insane, the reaction was present in 15, absent in 18, doubtful in 4, and unilateral in 3 cases. Of these 40 cases, 20 had Argyll Robertson pupils, and of these 20 the reaction was absent in 14 cases, present in 4 cases, and doubtful in 1 case. In 5 cases out of 40 the pupils did not react to light or accommodation; in these 5 cases the reaction was absent in 4 and present in 1 case. Of the 3 unilateral cases, in 2 cases the right pupil was inactive to light, while the left pupil reacted sluggishly; the right pupil was also larger than the left. In these cases the reaction was only obtained in the left eye. The other case was similar, with the exception that it was the right eye which had the smaller and active pupil, and which showed the reaction.

D. F. H.

Holth, S. and **Berner, O. Congenital Miosis from Developmental Faults of the Dilator Muscle.** Brit. J. Ophth., v. VII, No. 9, 1923, p. 401.

A pupil 1.5 mm. or less in diffuse daylight, the eyes looking at a distance, is in a pathologic contraction, Miosis. (The spelling "Myosis" is incorrect.)

Congenital miosis is extremely rare, the author having seen but three cases in thirty years. Little is to be found in ophthalmic literature concerning the subject. W. R. Wilde, X. Galezowski, Collins and Mayou, Kurt Saupe and D. T. Vail's short statements relative to the subject are referred to.

Since the autumn of 1897 Holth has had under observation two sisters and a brother whose pupils have all their lives had a diameter of about 0.5 mm.; after several days of instillation of mydriatics, the pupils were dilated to 2.5 mm. at the utmost, but generally less. Addition of cocain 5 per cent did not further dilate the pupils, but the palpebral fissures were enlarged (some exophthalmus); this fact shows that the cervical sympathetic nerve functions well. The three patients never squinted, and had good horizontal and vertical muscle balance for the distance of 5 meters; for reading distance (30 cm.) only the few normal degrees of exophoria, no hyperphoria. Only one of them—case (A)—had spasm of accommodation.

Case A, female, aged 21 years when first observed in 1897, her eyesight, like her elder sister and brother, who are twins, had always been poor in twilight. A younger brother has always had good sight. The parents were cousins. The father had small pupils (he refused examination). The patient complained of shortsightedness and headache. Pupils right 0.3 mm., left 0.5 mm. slightly excentric upwards. They do not react to light or convergence. Atropin dilated the pupils to 2.5 mm. This has been maintained for 26 years by the instillation of scopolamin 0.2 per cent, every morning. Omitting the mydriasis the pupils contracted and the symptoms recurred. Refraction right eye —2.75, left —1.25x 40° V=5/4. Without atropinization it required —10.D. to —12.D. to ob-

tain V.=5/5. After 26 years use of scopolamin the refraction is lower. Right—1.75° ⌒—.75x90°, left—.75⌒—.75x60°. If she had been emmetropic or hypermetropic without spasm of accommodation, a small iridectomy upwards would have been best.

Case B. Sister, aged 30 years when first observed. She never suffered headaches or spasm of accommodation. Right pupil 0.25 to 0.5 mm., left 0.5 to 1 mm. Under atropin right —7. V=5/6, left —8. V=5/5. She was kept under scopolamin for 22 years. Approaching the age of 50, its effect decreased until the pupils finally presented exactly the same condition present before treatment was instituted. The myopia increased. An upward iridectomy was performed and the pupil again became 2 mm. In her fifty-third year the patient died. The enucleated eyes were examined microscopically.

Case C. The twin brother, aged 52 years when first observed, was seen only once. Difficult to see in twilight; can read without glasses. Pupils 0.5 to 1.75 mm.; under atropia emmetropic. Patient died in his fifty-fifth year; his enucleated globes were examined microscopically.

A detailed description of the anatomic findings by Berner are incorporated in the contribution. Briefly stated, the membrane of Bruch was defective, the dilator muscle was poorly developed in patches, the spindle shaped epithelial cells which resembled plain muscle cells, but in which no myoglia fibers are developed. In the stroma of the iris where the dilator is absent, fetal mucoid tissue is present. Fifteen very excellent illustrations accompany the report.

In the matter of treatment: Presbyopes, leading an indoor life may not require any treatment. In outdoor life, twilight blindness may be treated by continued mydriatics. After the lapse of years its effect is lessened. Optical iridectomy may be done upward.

D. F. H.

Cummins, J. D. Wernicke's Pupillary Reaction. Brit. J. Ophth., v. VII, No. 9, 1923, p. 421.

Hess contends, the performance of the test requires a specially devised apparatus. In the clinical round, one usually obtains a contraction of the pupil, by illuminating either half of the fundus with a light held at the side. This procedure is faulty.

More satisfactory is the plan of placing the patient sideways, at a window, and, while directing him to look into the distance, of using diffuse daylight for illumination. Then, by turning right about, the other half of the fundus can be stimulated under like conditions. The eye, which is not being tested, ought to be covered with a dressing and light bandage. The refraction of the eye must be emmetropic. Otherwise, the source of light and the illumined point on the retina will not be conjugate foci.

D. F. H.

Terrien F. Diagnosis of Spontaneous Mydriasis. La Presse Méd. 1923, p. 783.

Aside from contusions of the eyeball, there are three principle causes for dilatation of the pupil; atropin, glaucoma and lesions of the anterior part of the third nerve. The diagnosis of atropin mydriasis can be made by noting that distant vision thru a pinhole is not blurred correspondingly to that without such diaphragm, and also the ability to read with a 3 or 4 diopter sphere; the glaucoma mydriasis is differentiated by the hardness of the eye and the failure of the two tests described above; the mydriasis of nuclear origin is usually due to a hemorrhage. The prognosis is very bad. There is often an associated paralysis of the muscles supplied by the third nerve.

The author recommends the instillation of pilocarpin nitrat, two parts in a hundred, to aid the contraction of the pupil.

L. T. P.

Ingalls, N. W. Dilator Pupillae and the Sympathetic. Jour. Comp. Neurol., 1923, v. 35, p. 163.

The author emphasizes the fundamental difference in the sphincter and dilator muscles of the iris, calling attention to the visual role of the former and the sympathetic role of the latter.

He notes the earlier origin of the sphincter and gives an anatomic description of each.

He likens the reaction of the dilator muscles to other organs presided over by the sympathetic such as sweat glands, hair, heart, abdomen or pelvic viscera. The agents which stimulate the dilator muscle are very largely those which accompany emotional disturbances and memory. These are stimuli which in general do not affect striate muscles.

L. T. P.

Di Marzio. Chloroma of the Orbit. Ann. di Ott. 1922, v. 50, p. 411.

The author's patient, a boy of seven, had been healthy till six months before he came in. Then he became anemic and lost energy. Two months before, the left eye became prominent, and a month later, the right. When first seen he was pale and emaciated, with marked exophthalmos of both eyes. The lids were pushed forward, and there were large hard, smooth masses passing out of each orbit onto the brow. That on the left side was the size of a small egg, that on the right the size of a nut. The blood count showed 24,000 whites, with 20% myelocytes and 40% mononuclears. An X-ray showed involvement of the sphenoid bone and all the accessory sinuses.

After two weeks the left cornea, which had become ulcerated from exposure, perforated, with the escape of purulent fluid, and some days after this the right eye did the same. The tumors above the eyes increased, as did the anemia and emaciation, and the child died on the fifty-fifth day of observation, four months after the exophthalmos was first noticed. Autopsy showed extensive involvement of the bony walls of the orbit with softening and infiltration. The tumor masses were chiefly in front of the muscle cone, and were composed of a lamellar stroma whose meshes were filled with large mononuclear cells and myelocytes. The masses showed the characteristic greenish color of chloromata. Foci of similar nature, but small, were found in one femur and the sternum.

From an extensive review of the literature, including a table of all published cases, (see also v. VI, p. 805), the predilection of the disease for young children is noted, its frequent involvement of the bones of the face with very little disease elsewhere, and the very early exophthalmos which occurred in most cases. It is also noted that in a fair number of cases the blood count early was practically normal, showing the leucemic picture only later. From this, with the characteristic color of the tumors, the author is lead to believe, in spite of its general acceptance as only a manifestation of leucemia, that chloroma is a disease *sui generis*, and that the leucemic blood picture may be only a secondary manifestation.

S. R. G.

Fay, T. and Grant, F. C. Lesions of Optic Chiasm and Tracts with Relation to Adjacent Vascular Structures. Arch. of Neur. and Psychiat., 1923, v. 9, pp. 739-750.

Fay and Grant call attention to the fact that there are four structures which may exert direct pressure against the visual pathways in the presence of a large invading supracellar lesion; the dural band connecting the anterior clinoid processes, the internal carotid arteries which pass upward about 1 cm. behind the chiasm and almost touch the optic tracts, the anterior cerebral arteries, which pass forward over the optic tracts and chiasm, and the anterior communicating artery, which lies just above and in front of the chiasm. Türck, in 1852, was the first to mention the effects on the visual pathways of pressure by adjacent arteries. Following him, cases were reported by Sachs, Erdheim, Uhthoff, Bartels, de Schweinitz and Holloway, and Cushing.

The authors' case was that of a man, aged 31, who showed, when first examined, bilateral choked discs of four diopters with slight contraction of the visual fields, especially along the temporal margins of the upper portions. A subtemporal decompression was made for the relief of increased intracranial pressure. In spite of this, there developed, in the course of a month, left lateral homonymous hemianopsia

with other localizing symptoms which seemed to indicate the advisability of a right parieto-occipital exploration. No tumor was found at operation. The patient died about seven weeks later. Necropsy revealed a supracellar adamantoma lying in the interpeduncular space just posterior to the chiasm. The center of the chiasm was slightly dimpled by pressure against the anterior communicating artery. The right optic tract was cut almost two-thirds thru by the right internal carotid artery, this being most probably the cause of the left homonymous hemianopsia. The left optic tract showed on its outer and lower aspect, 1.2 cms. behind the chiasm, a deep groove caused by the internal carotid artery. This groove was extended forward over the upper surface of the tract by the anterior cerebral artery. This pressure evidently gave rise to the defects in the left lower nasal and right lower temporal fields which were present in addition to the left homonymous hemianopsia.

The author's conclusions are:

1. The situation of the optic nerves, chiasm, and tracts makes them easily susceptible to injury from surrounding vascular structures in the presence of a rapidly growing tumor in the interpeduncular space.

2. With careful perimetry, defects of the lower nasal quadrants may indicate that lateral pressure is causing physiologic block of the visual pathways; the adjacent and overlying arteries may be responsible for the field defect.

3. Lesions of this character, owing to their concealed position, may easily be overlooked at necropsy.

4. The offending vessels are the internal carotids, the anterior cerebrals, and in several cases the anterior communicating artery.

In discussing this paper, Dr. F. X. Dercum called attention to a case of bitemporal hemianopsia reported in 1884 by Dr. S. Weir Mitchell, Dr. William Thompson and himself, in which necropsy had shown the optic chiasm divided in the median line by an aneurysm of the anterior communicating artery. H. V. W.

Sands, Irving J. Barbital (Veronal) Intoxication. Jour. of A. M. A., Nov. 3, 1923, v. 81, No. 18, p. 1519.

Sands states that frequently in barbital poisoning, the pupils react sluggishly to light, occasionally not at all. Spontaneous contraction and dilatation of the pupils is frequently encountered, a phenomenon regarded by some authorities as pathognomonic of the condition. Ptosis and diplopia are occasionally present.

In each of five cases which the author reports, the pupillary reactions were sluggish. In four of the cases nystagmus was present. One case presented a definite hippus. All of these five cases were of severe but not fatal poisoning. L. T. P.

Frenkel and Stillmunkes. Unilateral Argyll Robertson Sign with Symptoms of Rachitis. Bull. de la Soc. Méd. des Hôp., 1923, v. 39, u. 204.

Brule presents a case of unilateral Argyll Robertson pupil in a 19 year old girl who has other signs of congenital syphilis, namely, characteristic changes in the long bones.

L. T. P.

Behr, C. Metastatic Carcinosis of the Choroid and Optic Nerve. Lymphatics in Optic nerve and Disc. Klin. M. f. Augenh., 1922, v. 69, p. 788.

Nine years after the total extirpation of the breast of a woman, aged 50, sudden amaurosis of the right eye occurred as the first clinical sign of metastasis, followed by rapid cachexia. The ophthalmoscopic aspect determined the diagnosis of general carcinosis: An intense and broad fungiform swelling of the disc, narrow vessels, yellowish grey discoloration of the fundus with peculiar pigment islets, diagnosed as metastatic carcinoma of the disc and choroid. The autopsy verified this. There was carcinosis of the peritoneum, pleura, pericardium, liver, kidneys, pancreas, ovaries. Microscopically the optic disc showed epithelial cell carcinoma, also the optic nerve near the disc, with scirrhous cancer of the choroid, extending forward.

From the objective findings, it seemed probable that the carcinoma of

the optic nerve, which started in the axis near the disc, was a separate metastasis, with regard to time and space, from that of the choroid, as there was no conection between both. The limitation of the tumor to the ectodermal glious nervous tissue, with no transition to the mesodermal structure, or into the perivascular lymph spaces, or thru the pial sheath into the intervaginal space, demonstrates that the lymph paths of the disc and optic nerve constitute a closed system; which corresponds with the former observations of the author from his injections of dead human and live nerves of dogs. The carcinoma of the disc did not spread into the vitreous, which also speaks against a direct communication between the perivascular spaces of the disc and vitreous. C. Z.

Pillat, A. Influence of Parenteral Milk Injections on Bacterial Conjunctivitis. Klin. M. f. Augenh., 1923, v. 70, p. 439.

In judging the action of milk injections, one must strictly distinguish the action of the clinical picture from that on the germs themselves. In severe clinical symptoms of conjuntivitis due to Koch-Weeks bacilli, influenza, pneumococci, trachoma, and inclusion blennorrhea of the new born, the influence of milk injections is evident. In the first, from 12 to 18 hours, increase of inflammatory symptoms, then rapid decrease in the following 24 hours. The more intense the focal affection of the eye, the more marked is the clinical result. The influence on the germs seemed to be uncertain. In some cases they seemed to disappear more rapidly, but this may easily be explained by the mechanical effects of the milk injections: The increased hyperemia and transudation from the vessels into the tissue and the conjunctival sac, causes partly a mechanical flushing away, partly an increased desquamation of the epithelial cells loaded with germs.

Apparently the pathologically changed tissue and blood vessels are the points of attack by the milk injections. Therefore their strongest influence is seen in severe inflammations, while the light ones show no visible effect. The difference between the results in gonoblennorrhea and the other forms of conjunctivitis seems to lie in the difference of the minimum temperature by which the growth of the different germs is arrested. This is for gonococci 39° C., while for the others it is from 42° to 45°. Hence, it may be assumed that the gonococci are damaged by the higher temperature, which partly explains the prompt action of the milk injections on them.

C. Z.

Pillat, A. Reasons for Success or Failure of Parental Milk Injections in Gonoblennorrhea. Klin. M. f. Augenh. 1923, v. 70, p. 289.

Pillat's investigations showed that milk injections alone are able to cure gonoblennorrhea of adults, without any other treatment but indifferent irrigations. The time of healing in most cases is much shorter than under the usual methods, in his cases about seven days. Papillary hypertrophy and coexisting other conjunctival diseases retarded the cure, from which follows selection of proper cases for this treatment. After all milk injections considerable fever sets in, which probably has a certain curative influence. The local reactions on the eye are described in detail. For the practitioner Pillat recommends combination of milk injections with the old therapy with nitrat of silver. He considers the milk treatment of gonoblennorrhea as one of the most valuable therapeutic measures of the last few years in ophthalmology. C. Z.

NEWS ITEMS

Personals and items of interest should be sent to Dr. Melville Black, 424 Metropolitan Building, Denver, Colorado. They should be sent in by the 25th of the month. The following gentlemen have consented to supply news from their respective sections: Dr. Edmond E. Blaauw, Buffalo; Dr. H. Alexander Brown, San Francisco; Dr. V. A. Chapman, Milwaukee; Dr. Robert Fagin, Memphis; Dr. M. Feingold, New Orleans; Dr. Wm. F. Hardy, St. Louis; Dr. Geo. F. Keiper, LaFayette, Indiana; Dr. George H. Kress, Los Angeles; Dr. W. H. Lowell, Boston; Dr. Pacheco Luna, Guatemala City, Central America; Dr. Wm. R. Murray, Minneapolis; Dr. G. Oram Ring, Philadelphia; Dr. Chas. P. Small, Chicago; Dr. John E. Virden, New York City; Dr. John O. McReynolds, Dallas, Texas; Dr. Edward F. Parker, Charleston, S. C.; Dr. Joseph L. McCool, Portland, Oregon; Dr. Richard C. Smith, Superior, Wis.; Dr. J. W. Kimberlin, Kansas City, Mo.; Dr. G. McD. Van Poole, Honolulu; Dr. E. B. Cayce, Nashville, Tenn.; Dr. Gaylord C. Hall, Louisville, Ky.; Dr. Edward D. LeCompte, Salt Lake City.

DEATHS.

Dr. Conrad Berens, of Philadelphia, died October 6th, aged 64.

Dr. A. Bourgeois, of Paris, died recently.

Dr. William S. Frost, of Spokane, Washington, died September 8th from injuries in an automobile accident.

Dr. William M. Reed, of Kansas City, Mo., aged 57, died November 2nd, after a two weeks' illness, of endocarditis.

PERSONAL.

Dr. A. Ray Irvine, now practicing Ophthalmology in Los Angeles, visited in Salt Lake City early in November.

Prof. Köppe, of Halle, has been lecturing in Spain and Italy on "Microscopy of the Living Eye."

Dr. James B. Stanford announces the removal of his offices to 877-878 Shrine building, Memphis, Tennessee.

Prof. Gilbert, known thru his contributions to the literature on uveitis, hitherto of Munich, has settled in Hamburg.

The latest word from Dr. Casey Wood is that he returned to Suva early in October with his artist companion, Mr. W. J. Belcher. They had been studying the bird life of the Macuata Coast of Vanua Levu. The Fiji Islands seem to have afforded an unusual attraction for Dr. Wood, as he has prolonged his stay there considerably. He is probably now in Honolulu and will shortly return to California, where he and Mrs. Wood will spend the winter.

SOCIETIES.

Dr. E. V. L. Brown and Dr. Joseph Beck, of Chicago, were guests of the Kansas City Eye, Ear, Nose and Throat Society and the Kansas Clinical Society at their joint meeting during the week of October eighth.

At the November meeting of the Kansas City Ear, Eye, Nose and Throat Society, Dr. John McMullen of the U. S. Public Health Service was the guest of honor. In the afternoon he gave a most interesting diagnostic trachoma clinic, and in the evening presented a lantern slide demonstration of the diagnosis and treatment results in trachoma.

The Utah Ophthalmological Society for the ensuing year has elected the following officers: President, Dr. A. J. Ridges of Salt Lake City; vice-president, Dr. L. W. Oakes of Provo, Utah; and secretary-treasurer, Dr. C. A. Broaddus of Salt Lake City. Meetings of the society are held on the third Monday of each month.

At the meeting of the Section on Ophthalmology of the New York Academy of Medicine November 19th, papers were read by Dr. Alexander Duane on "The Associated Movements of the Eyes, their Nerve Centers, Conducting Paths, Production, Varieties and Derangements," and by Dr. Julius Wolff, on "A Conjunctival Apron or Safety Flap in Cataract Extraction." These papers were followed by a general discussion.

The twenty-eighth annual meeting of the American Academy of Ophthalmology and Otolaryngology was held in Washington, D. C., Oct. 16-20, under the presidency of Dr. T. E. Carmody, Denver. Dr. Hubert Work, Secretary of the Interior, delivered the address of welcome. The following officers were elected for the ensuing year: President, Dr. Walter B. Lancaster, Boston; vice-presidents, Drs. William P. Wherry, Omaha, S. Hanford McKee, Montreal, Canada and Harry L. Pollock, Chicago; treasurer, Dr. Secord H. Large, Cleveland; secretary, Dr. Luther C. Peter, Philadelphia. Dr. Clarence Loeb, Chicago, was elected editor of the transactions.

During the week beginning October second, the new City Hospital of Buffalo was dedicated. Clinics and addresses were given by many of the leaders of the profession including Dr. Wilbur, President of the American Medical Association, and Dr. Whiteside, President of the Medical Society of the State of New York. The ophthalmic clinic was conducted by Dr. Harry S. Gradle, of Chicago, and was attended by most of the local oculists. On the evening of October third Dr. Gradle was entertained at dinner by the Buffalo Ophthalmic Club and later addressed the members, reading a paper, illustrated by photographs, on "Pupillary Reaction." His visit and address were thoroly enjoyed by all who had the privilege of being present.

MISCELLANEOUS.

Drs. Thomas W. Moore and William F. Beckner, announce a change in the name of the Moore-Beckner Hospital, Huntington, W. Va., to the Huntington Eye, Ear and Throat Hospital.

The law division of the New York City Department of Health now requires that all physicians and other persons in attendance on confinement cases shall instil into the eyes of new born children a 1 per cent solution of nitrat of silver to prevent the development of ophthalmia neonatorum.

Dr. F. Phinizy Calhoun, Atlanta, Ga., and members of his family have made a "founders' roll" subscription of one thousand dollars to the Stone Mountain Confederate Memorial, in memory of the late Dr. Abner Wellborn Calhoun, who at the age of fifteen enlisted as a private in the First Georgia Regiment.

Thru the activity of the United States Public Health Service, cooperating with the Kentucky State Board of Health, one of the worst trachoma regions in this country has been practically cleared of the disease within a period of less than ten years.

At the annual congress of the Société Française d'Ophtalmologie in 1922, it was proposed to form the Ligue contre le trachome, and at the meeting of the Colonial Congress of Public Health at the Pasteur Institute, Paris, in April, the league was definitely established. The first number of the Bulletin de la ligue contre le trachoma has just been issued and contains an account of the proceedings which led to the formation of the league. The officers elected were: President, Dr. Charles Nicolle; vice-presidents, Drs. Morax and Aubaret, and secretary, Dr. Paul Petit, 19 rue de Bourgogne, Paris.

The National Committee for the Prevention of Blindness is taking a census to determine the accidental causes of ocular injuries. During one month a total of 318 eye accidents was reported to the committee, and during three months, 907 eye accidents were reported. Two hundred and thirty-eight resulted in total loss of one eye. It is very probable that the number of such accidents reported represents only a small proportion of the total number that actually occurred. Oculists will confer a favor on the National Committee, with headquarters in New York City, if they will report their accident cases to them.

The gift of "color hearing" is one which has sometimes embarrassed its possessor, who has kept this particular light under a bushel for fear his friends should mark him down as a prospective inmate of an asylum. It seems, however, now to be generally agreed that the association of certain sounds with certain colors is not a morbid state, tho it is undoubtedly rare. Psychologists have given the terms "synesthesias" or "secondary sensations" to these curious correlations of the sense of color with the senses of smell, taste, and sound. Goethe knew of this condition which, in 1881 was the subject of important researches in Germany. It was found by Bleuler and Lehmann that 12 per cent of the 596 persons examined were in possession of synesthesias.

These vary considerably in degree; a "color hearer" may experience a certain definite color sensation when he merely thinks of certain sounds and words without actually hearing them. This condition may become less noticeable with age, but thruout life certain sounds are associated with the same colors, a sound never giving rise to a sensation of green at one age and of red at another in the same person. Possessors of this gift are sometimes able to detect a discord only when they refer the matter to their color sense.

In a recent paper by Dr. H. Lundborg, an account has been given of a Swedish family, in three generations of which this and other psychic phenomena were studied with a view to ascertaining whether, or not, they are inherited according to Mendel's laws. He has come to the conclusion that they follow these laws as faithfully as more material properties. In the first generation the father was a "color hearer." In the second generation there were three male and three female "color hearers," and in the third generation there was one male to two female "color hearers." In the same family such psychic qualities as a vivid imagination, a marked sense, or "bump" of locality, and a craving to travel, or write were investigated, and it is interesting to note from the genealogic tables published by Dr. Lundborg that these qualities are handed down from one generation to another in a remarkably uniform manner.

—*Lancet*, Nov. 17, 1923, p. 1117.

Current Literature

These are the titles of papers bearing on ophthalmology. They are given in English, some modified to indicate more clearly their subjects. They are grouped under appropriate heads, and in each group arranged alphabetically, usually by the author's name in **heavy-face type.** The abbreviations mean: (Ill.) illustrated; (Pl.) plates; (Col. Pl.) colored plates. Abst. shows it is an abstract of the original article. (Bibl.) means bibliography and (Dis.) discussion published with a paper. Under repeated titles are given additional references to papers already noticed. To secure early mention, copies of papers or reprints should be sent to AMERICAN JOURNAL OF OPHTHALMOLOGY, 217 Imperial Building, Denver, Colorado.

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THE FEBRUARY NUMBER

Among the original papers to be published in the February number of this Journal will be the following:

A Report of the Changes Found in the Eyes of Rabbits Following the Injection of Living Tubercle Bacilli into the Common Carotid Artery, by **William C. Finnoff** of Denver.

The experimental method used gives positive results in every animal, and a profusion of tuberculous lesions in various parts of the eye and its appendages. These were observed in the anterior segment of the eyeball, or with the opthalmoscope thruout their course; and the histologic changes studied with the microscope after careful preparation and staining.

The illustrations include two colored plates and fourteen reproductions of microphotographs, showing the appearances described.

Xerophthalmia, Keratomalacia and Xerosis of the Conjunctiva, by **Olaf Blegvad** of Copenhagen, Denmark.

This paper presents in full summary the facts collected by Dr. Blegvad in his book upon the subject noticed in the Journal last November (v. 6, p. 939). It is illustrated by 15 charts summarizing the statistical studies of cases from many points of view. The views it embodies will become authoritative with regard to the influence of vitamin deficiency in causing eye disease.

Reform Diet as a Therapeutic Measure in Ophthalmic Practice, by **George Huston Bell,** New York City.

This paper points out the importance of toxemia originating in the gastrointestinal tract, to be considered with focal infections as a cause of ocular disease. It also indicates a reform diet found to remove the persistent disturbances of digestion most common among dwellers in cities, with the ocular disturbances to which they give rise.

Osteoma of the Orbit, by **Arthur J. Bedell,** Albany, New York.

Reported cases of this form of tumor (ivory exostosis) are here reviewed. A new case is reported in which the orbital swelling was scarcely noticed until inflammation of the parts occurred. The tumor arose from the orbital plate of the ethmoid in the depth of the orbit. It was removed. The eyeball was restored to its normal position and retained full vision. Seven illustrations indicate the clinical appearances of the patient, the X-ray pictures showing the location of the tumor and the results obtained.

Liquefaction and Absorption of the Crystalline Lens with Its Possible Relations to Lens Opacities, by **C. A. Clapp,** Baltimore, Maryland.

Facts known about the development and structure of the crystalline lens and its chemical composition were made the starting point of studies with regard to the liquefaction of the lens when exposed to the action of the aqueous. The bearing of the results obtained on theories of cataract formation is taken up; and the indications furnished with regard to treatment are given.

The regular departments: Notes, Cases and Instruments, Society Proceedings, Editorials, Book Notices, Abstracts, News Items and **Current Literature,** will all include matters of general interest to the profession.